JANUARY 1, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

FORD STYLING

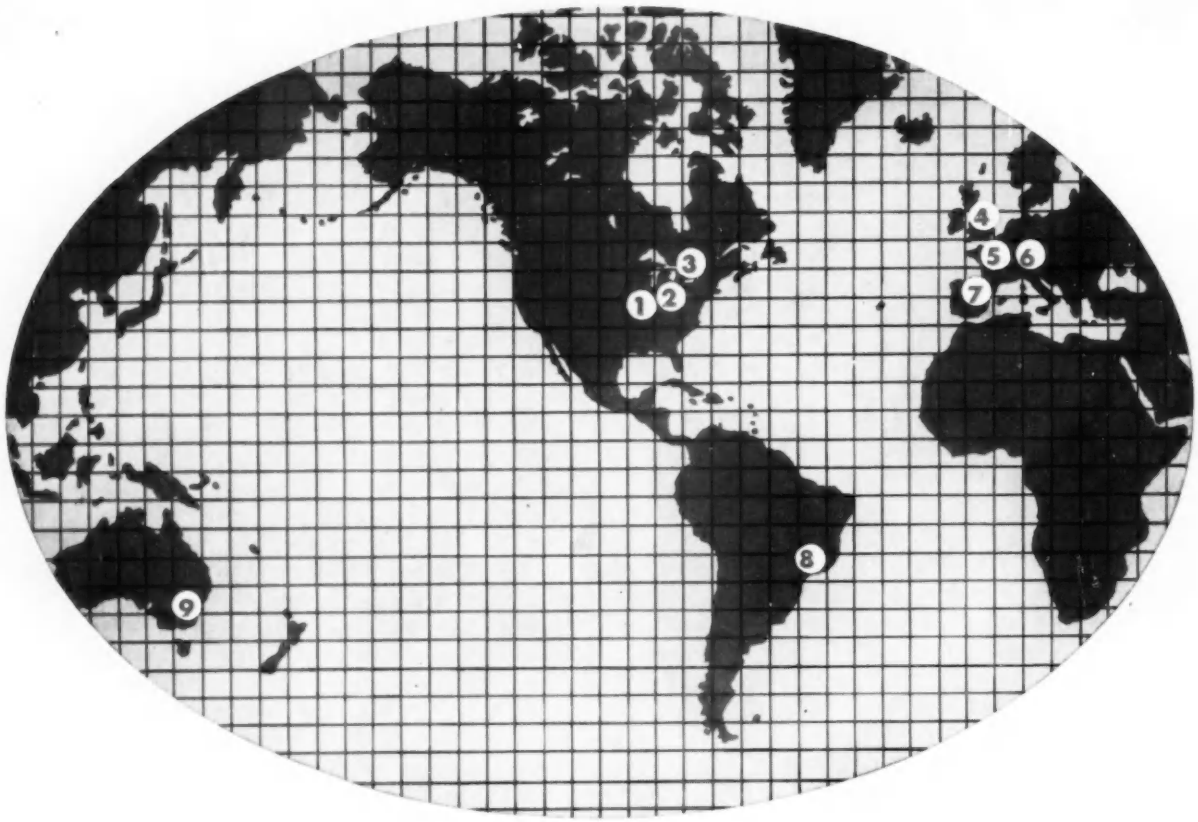
...AT WORK

By HUGH C. QUINN, Regional News Editor

GEORGE W. WALKER, Ford Motor Co. vice president and director of styling. Behind him two vehicles typify Ford's past and future. On the left is scale model of the 1949 Ford car—the first car done for Ford by Walker; on the right, a model of a vehicle embodying a new shape in automotive styling

ALSO IN THIS ISSUE . . . .

OUTLOOK FOR '61 . . . a preview
MACHINING OPERATIONS AT OLDSMOBILE
DETAILED 1961 CAR SPECIFICATIONS



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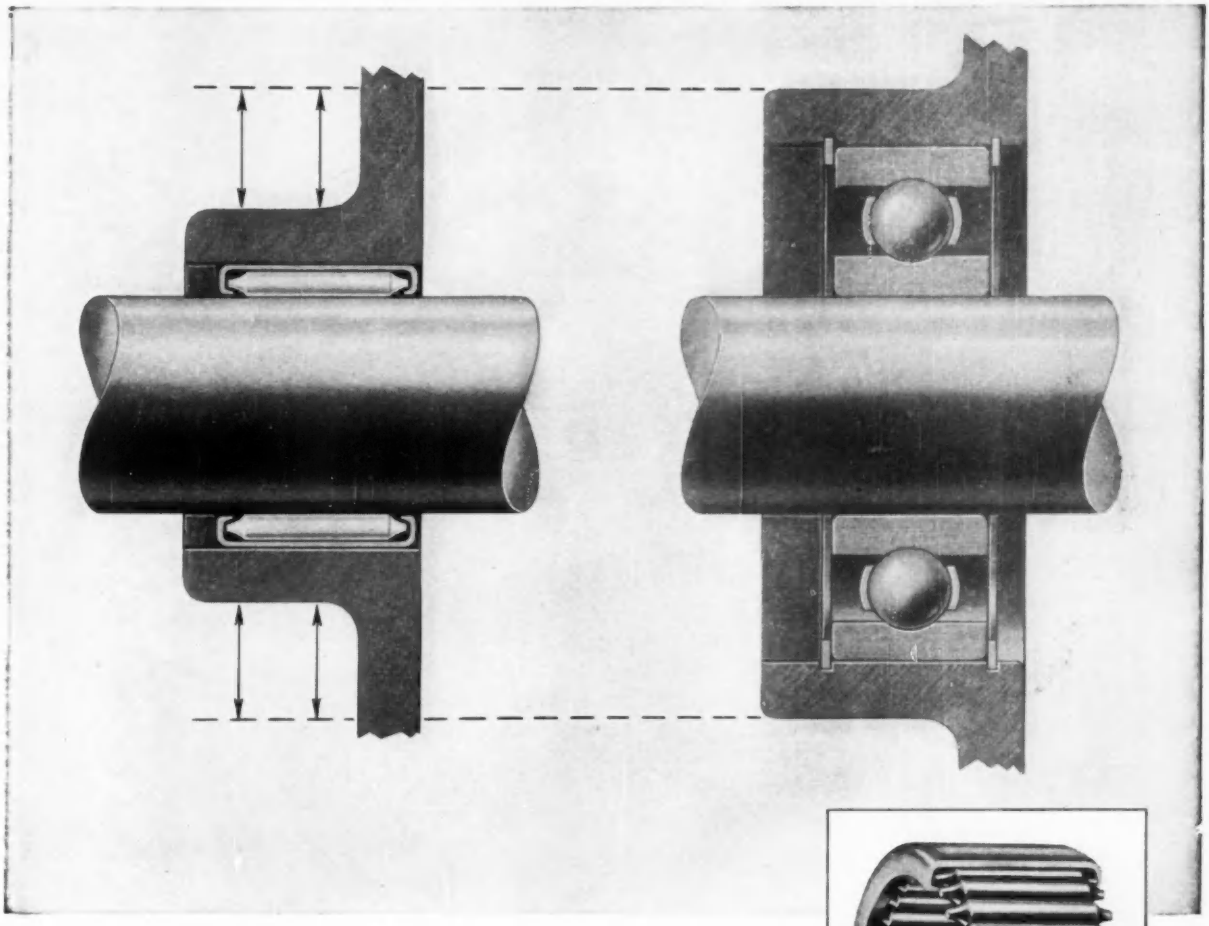

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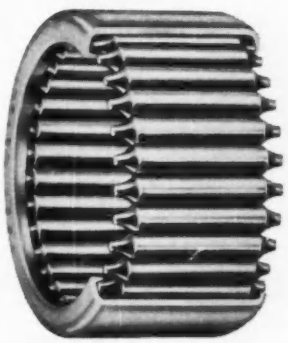

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For components that meet all but the severest loading and abrasion, the I-H designers selected carburizing grade nickel alloy steels of the AISI 4300 series for the best combination of case and core properties. Carburized AISI 4300 steels (containing 1.85% Nickel) are used for the spiral bevel ring gear, differential pinions and side gears, transmission shafts, and integral axle and sun gear.

When you design, order, or use heavily stressed components of trucks or construction equipment, remember that nickel alloy steels take the tough jobs in stride. The new 76-page booklet, "Nickel Alloy Steels . . . in Engineering Construction Machinery" is packed with valuable engineering information. Write for a free copy. ®Reg. T.M., International Harvester Co.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JANUARY 1, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 124, No. 1

Features • • •

FORD STYLING AT WORK.....PAGE 33

By Hugh C. Quinn, *Regional News Editor*

This interesting article discusses the styling techniques at Ford from the start to finish. It points out how and why styling experts like George W. Walker and his staff choose one design rather than another. There is a colorful description of the office used by Mr. Walker at Ford. Illustrations of both the actual styling operations for the new cars, and several futuristic designs for the atomic age are included.

MACHINING 1961 OLDSMOBILE COMPONENTS....PAGE 38

By Joseph Geschelin, *Detroit Editor*

Manufacturing techniques developed by the Central Foundry Division of the General Motors Corp. are covered in a comprehensive article which discusses the main features of the machining operations. Production problems and how they were solved are explained in the illustrated description. The production of the aluminum cylinder head for the V-8 engines, and the front cross members, are the main concern of the article. Some illustrations pertinent to these machining operations were shown in the September 15, 1960 issue of AI.

1961 PASSENGER CAR SPECIFICATIONS.....PAGE 42

By Marcus Ainsworth, *Statistical Editor*

Detailed specifications for all American passenger cars are shown in chart style with coded notations at the bottom of the page for quick reference to any particular dimension on any given car. Covered in the 12 pages of specs are: piston rings, piston pins and connecting rods; crankshafts and camshafts; fuel and cooling systems; starting and ignition systems; timing, spark plugs, clutches and transmissions—both conventional and automatic.

10 NEW PRODUCT ITEMS . . . and Other Features, *such as:*

Machinery News; Manufacturers' News; Automation News Reports; Airbriefs; Metals; and News of the Automotive and Aviation Industries.

continued on next page

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AUTOMOTIVE INDUSTRIES

News Previews • • •

AMC Rebate Plan Stirs Action..... 17
SAE Meets Jan. 9-13 in Detroit..... 18
Chevrolet Reported Planning Second Compact..... 19
Wright or Bugas May Succeed McNamara at Ford..... 19
GMC Offers Torque Divider for Trucks..... 19
Massey-Ferguson Expects Good Year..... 19
Michigan Continues as Auto Production Leader..... 20
GMC Adds New Tandem Trucks..... 20
Outlook for '61 Called Good..... 23
Keener Predicts Record Tire Sales..... 24
AMC Realigns Seven Top Executives..... 26
AMA Approves Next Auto Show for 1962..... 26
AMC Sales Top Billion for First Time..... 26

Departments • • •

Calendar of Coming Events..... 8
Letters to the Editor..... 13
News of the Automotive and Aviation Industries. *By Hugh C. Quinn and C. B. Campbell*..... 17
Tabloid..... 24
Men in the News..... 29
Editorial Page. *By Hartley W. Barclay*..... 31
1961 Passenger Specifications. *By Marcus Ainsworth*..... 42
Metals. *By William Boericke*..... 55
Airbriefs. *By R. Raymond Kay*..... 56
Industry Statistics. *By Marcus Ainsworth*..... 57
Machinery News. *By Charles A. Weinert*..... 60
Meet the AI By-Liners—Introducing *Howard Kohlbrenner*..... 61
A.I. Auto-Technics Data Sheets..... 63
New Plant and Production Equipment. *By C. J. Kelly*..... 64
Automation News Report. *By C. J. Kelly*..... 66
New Automotive and Aviation Equipment. *By C. J. Kelly*..... 71
On Our Washington Wire..... 74
Manufacturers' News..... 78
Advertisers' Index..... 90
Free Technical Literature.....At Back of This Issue

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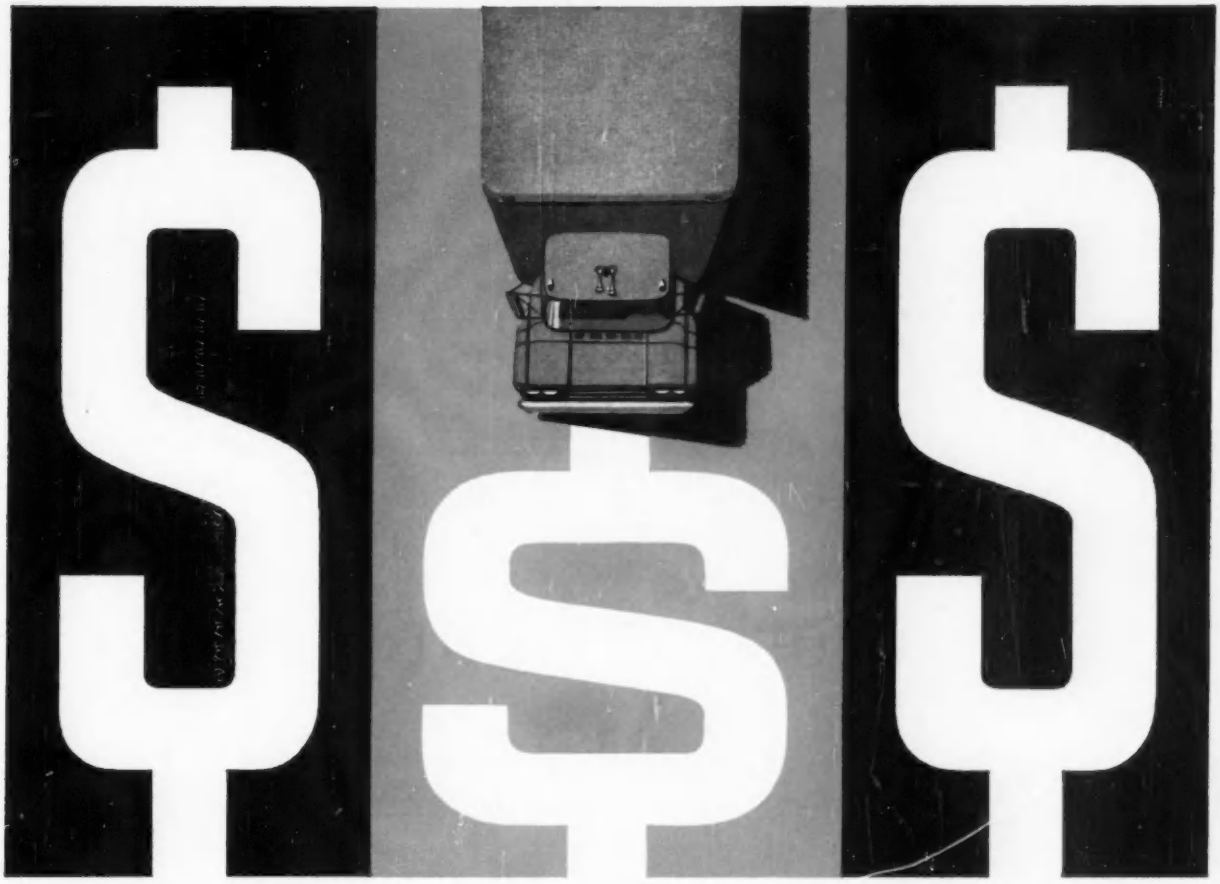

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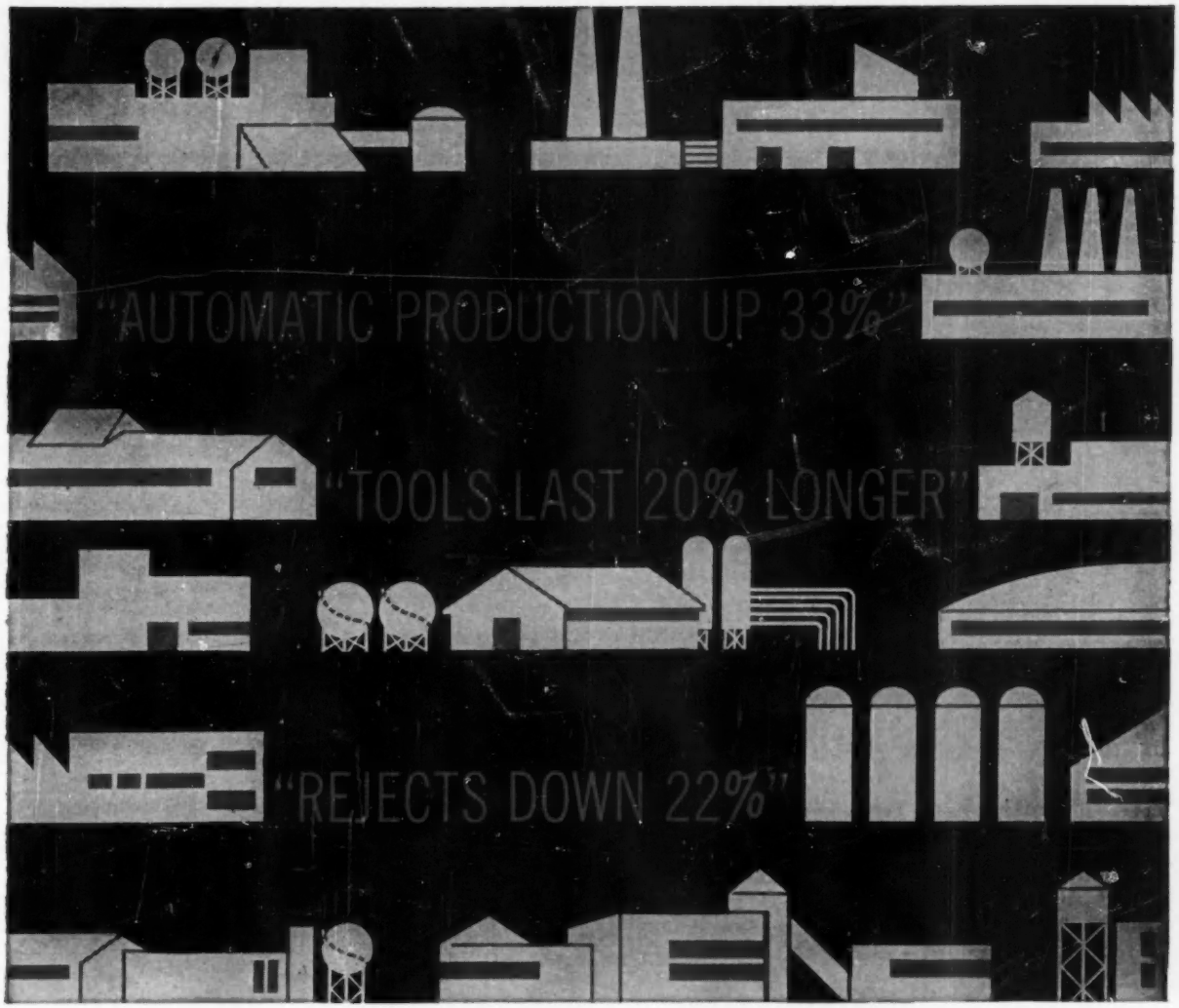

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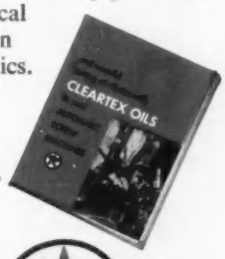

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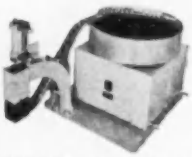

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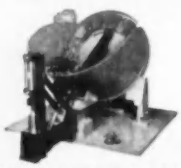

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CALENDAR

OF COMING SHOWS AND MEETINGS

Society of Automotive Engineers, International Congress and Exposition, Detroit .....Jan. 9-13

National Motor Boat Show, New York .....Jan. 14-22

Instrument Society of America, Winter Instrument-Automation Conference & Exhibit, St. Louis Jan. 17-19

29th Annual Meeting, Institute of the Aeronautical Science, New York .....Jan. 23-25

12th Annual Plant Maintenance & Engineering Show, Chicago Jan. 23-26

Society of Plastic Engineers, Inc., 17th Annual Technical Conference, Washington, D. C....Jan. 24-27

The Society of the Plastic Industries, Inc., 16th Reinforced Plastic Div. Conference, Chicago .....Feb. 7-9

American Foundrymen's Society, Wisconsin Regional Conference, Milwaukee .....Feb. 9-10

Malleable Founders Society, Semi-Annual Meeting, Cleveland..Mar. 1-2

American Society of Mechanical Engineers, as Turbine Power Div., Co-Sponsored by the Dept. of Defense, 6th Annual Gas Turbine Conference & Show, Washington, D. C.....Mar. 5-9

Instrument Society of America, 11th Annual Conference on Instrumentation for the Iron and Steel Industry, Pittsburgh..Mar. 8-10

The Steel Founders Society of America, Annual Meeting, Chicago .....Mar. 11-14

The American Society of Mechanical Engineers, Aviation Conference, Los Angeles.....Mar. 12-16

American Society for Metals, Western Metal Exposition, Los Angeles .....Mar. 20-24

23rd Annual American Power Conference, Sponsored by Six National Engineering Societies, Chicago .....Mar. 21-23

Spring Technical Meeting, Pressed Metal Institute, New York.Mar. 22-24

Management Engineering Conference, American Society of Mechanical Engineers, Society for the Advancement of Management, New York City .....Apr. 6-7

43rd Anniversary National Truck, Trailer & Equipment Show, Los Angeles .....Apr. 13-15

American Welding Society, 42nd Annual Convention and Welding Exposition, New York..Apr. 10-21

18th Annual Western Section Conference, Society of the Plastics Industry, Inc., Coronado, Calif. .....Apr. 20-21

65th American Foundrymen's Society Exposition, San Francisco .....May 8-12

American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York .....May 22-26

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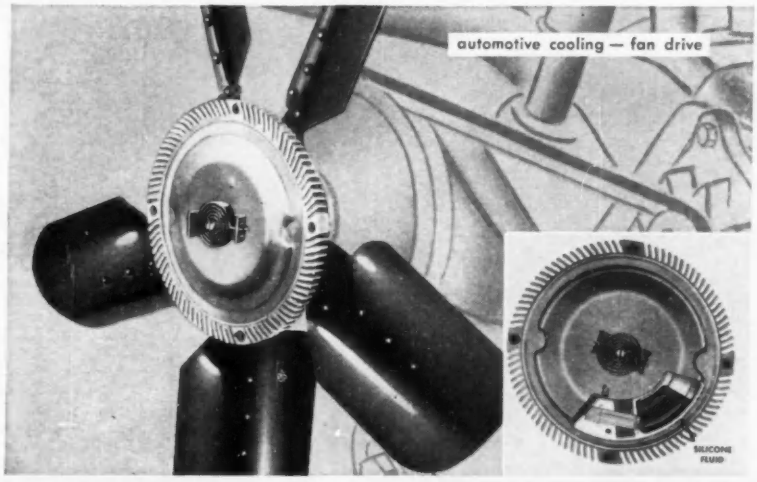
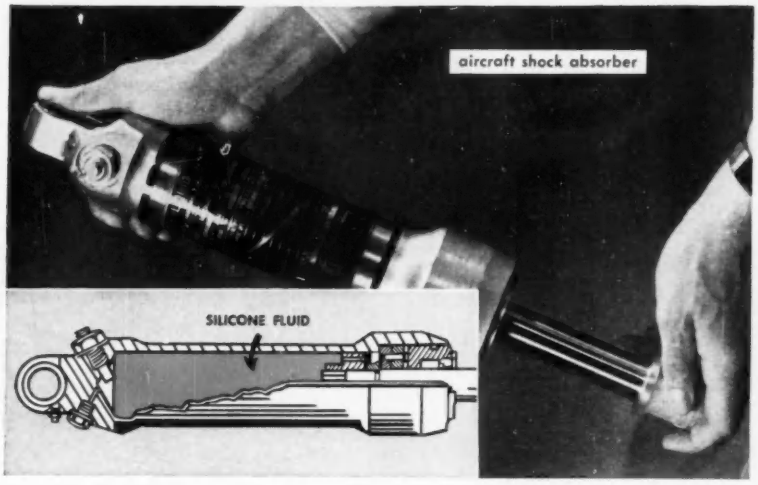
SILICONE NEWS from Dow Corning

How To Improve Designs





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Design more efficient mechano-fluid devices. Assure reliable, uniform performance. Do both with Dow Corning silicone fluids.

Silicone fluids let you forget time because they are resistant to oxidation . . . are nongumming and nonsludging. Silicone fluids let you forget temperature because they maintain a near-constant viscosity, regardless of whether operating environment be hot or cold . . . are serviceable at temperatures as low as minus 100 F; at temperatures as high as 400 F.

Furthermore, silicone fluids are highly resistant to breakdown due to shear; are noncorrosive.

These are the reasons silicone fluids make possible design changes impractical with other fluids . . . help improve damping devices, fluid couplings, liquid springs and hydraulic power drives. Here are two typical examples:

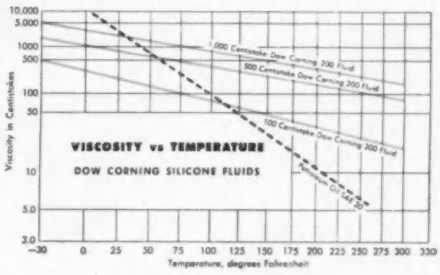
Unimpaired Drive Action

The Visco-Drive assembly shown opposite, designed and manufactured by Eaton Manufacturing Company, automatically slows automotive engine fans at high speeds when cooling is least needed . . . conserves horsepower and reduces noise.

Eaton engineers specify Dow Corning silicone fluid as the drive medium to assure uniform driving action over long periods of time under widely differing conditions.

Soaks Up Shock

Another example is an aircraft shock absorber manufactured by Cleveland Pneumatic Tool Company. Because the Dow Corning silicone fluid used in this liquid spring is much more compressible than other liquids, designers were able to reduce size of the oil chamber by 30%, thus saving vital weight and space.



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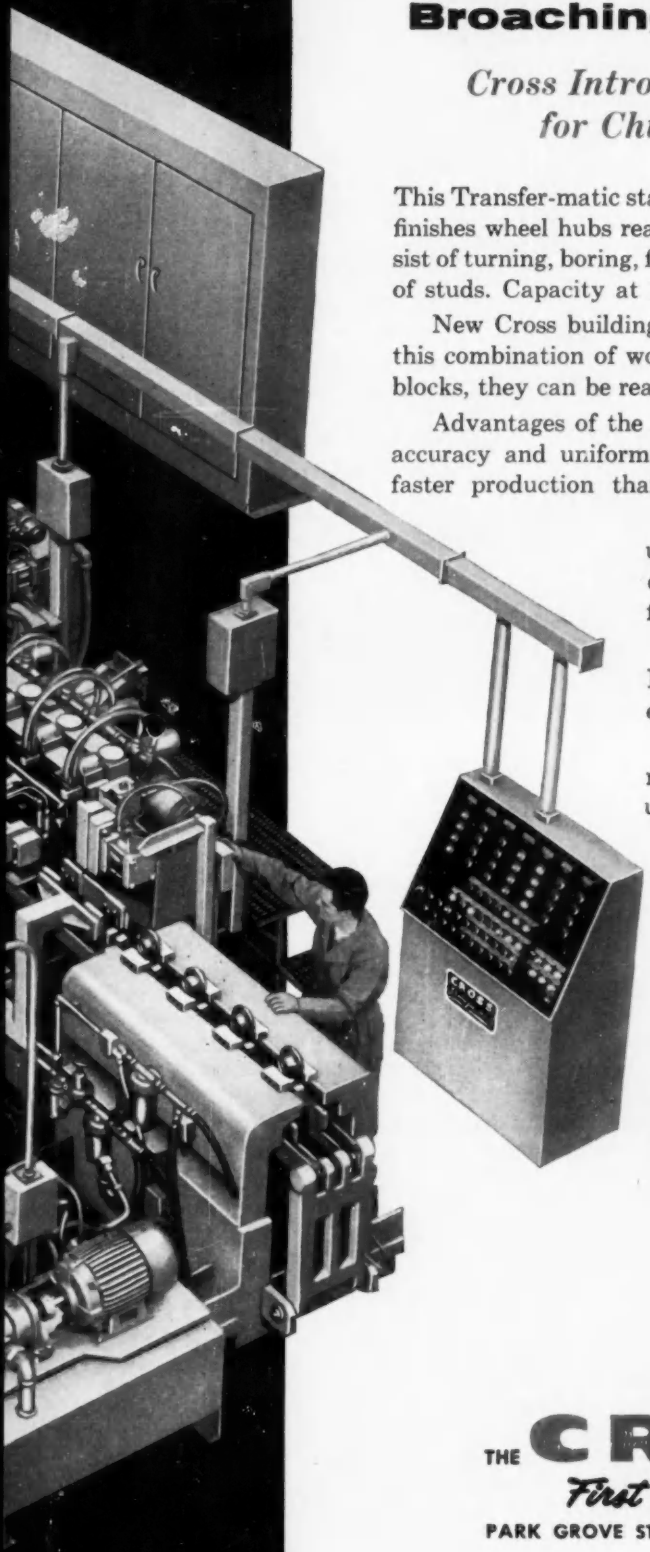
Tool slides are rotated to the upward position so tools can be seen, reached and replaced easily.

Another Automation First by Cross

New Transfer-matic Combines Chucking with Drilling, Broaching and Assembly

Cross Introduces Building Blocks for Chucking Operations



This Transfer-matic starts with rough castings and completely finishes wheel hubs ready for final assembly. Operations consist of turning, boring, facing, drilling, broaching, and assembly of studs. Capacity at 100% efficiency is 200 parts per hour.

New Cross building blocks for chucking operations make this combination of work possible. Like other Cross building blocks, they can be rearranged as requirements change.

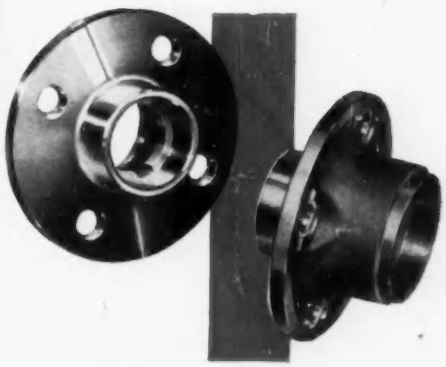
Advantages of the new Transfer-matic include maximum accuracy and uniformity, higher output, less handling, and faster production than conventional methods.

Heavy duty, three jaw chucks are used on the roughing operations but diaphragm types are employed for finishing to avoid clamping distortion.

A work bank between Sections I and II permits independent operation of either one during maintenance.

The new building blocks include a novel slide unit which tilts the tools upward to speed changes.

Cross engineers will gladly discuss details of this Transfer-matic with you.



Established 1898

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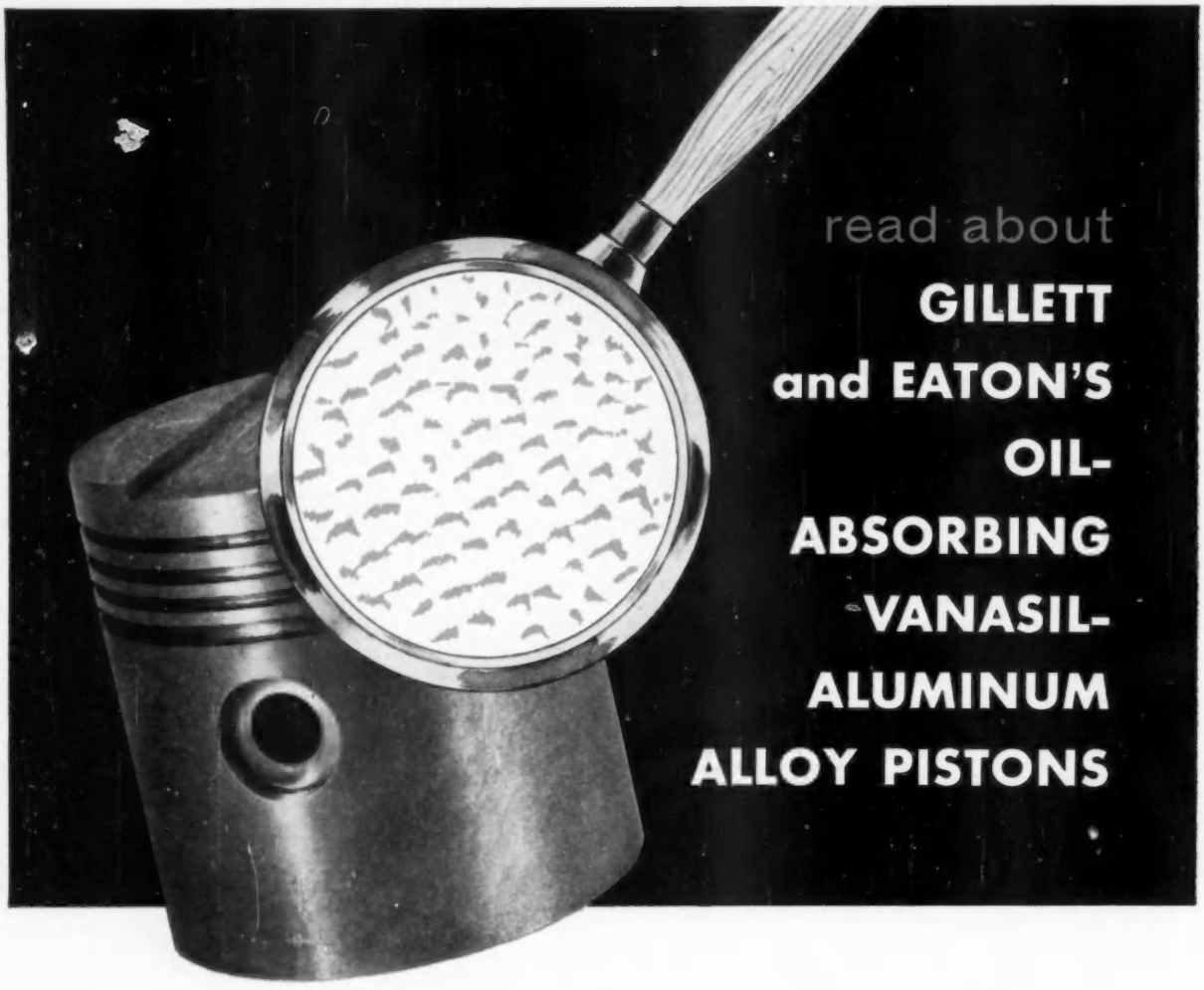


METALLURGISTS have tested piston metals from strong (but heavy) iron to light (but soft) aluminum. From all the alloys in between, they have found only one with all the properties ideal for pistons.

This one unique alloy combines the strength of iron and the lightness of aluminum. Oil absorbing Vanasil, is a Hyper-eutectic silicon aluminum alloy, and is manufactured exclusively by Gillett & Eaton, Inc.

A high silicon-to-aluminum ratio is precisely maintained to make Vanasil 30% harder than ordinary piston aluminum, and in addition increases "hot strength". Diesel trucks have repeatedly run over 200,000 miles with under .005" wear in the top ring groove of Vansil pistons—reducing wear up to 75% at this vital point.

When Vanasil solidifies in casting, the molecular structure changes into hard, inter-locking crystals. It becomes amazingly porous. In operation, the microscopic pores absorb oil from the fuel or lubrication system.

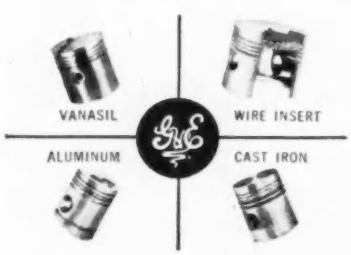
Saturated with oil, lubricity of the pistons is increased so that they require less energy and fuel to deliver full rated power. Should the lubrication system fail, Vanasil pistons retain enough oil to bring the engine to a safe stop.

Light weight and the increased freedom from friction of oil-absorbing Vansil pistons has in many cases increased engine power up to 25%. Why not find out if these long-wearing pistons can increase the performance of your engines? Write for specifications and test data.

See G & E Products on display at SAE International Congress and Exposition at Cobo Hall, Detroit, Michigan, Jan. 9-13, Booth 1607

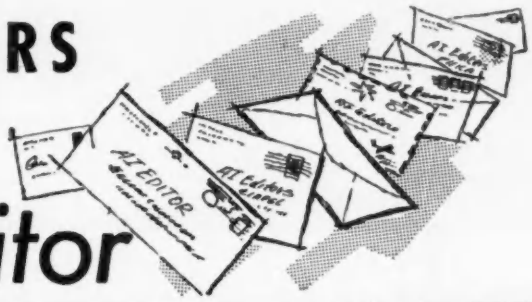
GILLETT & EATON INC
VANASIL®
HYPEREUTECTIC ALLOY

GILLETT & EATON, INC.
841 DOUGHTY STREET, LAKE CITY, MINN.
Sold in Canada by
Gould National Batteries of Canada, Ltd., Fort Erie, Ontario
Casting and piston specialists established 1868



Circle 111 on Inquiry Card for more data

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

STEAM CARS

We would greatly appreciate any information you may have in your files of AUTOMOTIVE INDUSTRIES relative to steam generators used in the "Doble" and "Stanley" steam cars. The Doble was a condensing system and would be of particular interest.

The dates are in the period from 1916 to 1920. We would appreciate any data on their operating temperatures and pressures, steaming capacity, heating surface and other mechanical characteristics.

Richard L. Owen
Chief Engineer
Frank Mayer Engineering Co
Los Angeles, Calif

● *All the material that we could "dig up" is on the way. —Ed.*

INTERNAL COMBUSTION ENGINES

Will you please make up and ship as quickly as possible 200 36-page reprints of the "Internal Combustion Engines" Section which appeared in your annual Statistical Issue.

Harry J. Lemmer
Advertising Manager
Waukesha Motor Co.
Waukesha, Wis.

FORGINGS

We are interested in procuring reprints of two articles which appeared in recent issues of your trade publication.

Please submit your price and delivery for the following:

6000 reprints of the following two (2) part article, "Valves Forged at High Rate in Automatic Equipment at Chevrolet" and "How Valves are Machined at Chevrolet in Mechanized Setups."

C. H. Beck
Purchasing Agent
The National Machinery Co.
Tiffin, Ohio

'28 CHEVY

I certainly enjoyed your 32 page, 4-color editorial covering the descriptions of the 1961 cars.

I recently acquired a 1928 Chevrolet coupe and would appreciate any information you could provide regarding paint and interior trim, as it is my intention to restore it to its original condition.

Dana J. Schneider
President
Hydraulic Unit Specialties Co
Waukesha, Wis

● *Suggest you write to Public Relations, Chevrolet Motor Division of General Motors Corp., 3044 West Grand Blvd., Detroit 2, Michigan.—Ed.*

PHOTOSTRESS®

We were pleased to see your mention of our PhotoStress analysis technique in the article, "Making Aluminum Cylinder Blocks" for the Rambler Classic Six Engine on page 36 of your November 1st issue.

We would like to point out that Photo-Stress is a registered name and should be written in one word, capitalized, and to be followed by R.

May we count on the cooperation of you and your staff to observe this form in any future mention of this Budd proprietary product.

George L. Christian III
The Budd Co.
Philadelphia, Pa.

● *Roger.—Ed.*

YOU CAN "PUT THE BITE" ON Southern

Southern fasteners would pass the old-time "bite" test for quality without a doubt. They'll stand any test for quality because they are made by USA specialists using USA materials.

You can "put the bite" on Southern for service, too. Contact your Southern distributor today, or write, wire or phone Southern Screw Company, P.O. Box 1360, Statesville, North Carolina. Phone TRiangle 3-7213.

Manufacturing and Main Stock in Statesville, North Carolina. Warehouses: New York • Chicago • Dallas • Los Angeles

Machine Screws & Nuts • Tapping Screws • Stove Bolts • Drive Screws • Carriage Bolts • Continuous Threaded Studs • Wood Screws • Hanger Bolts • Dowel Screws

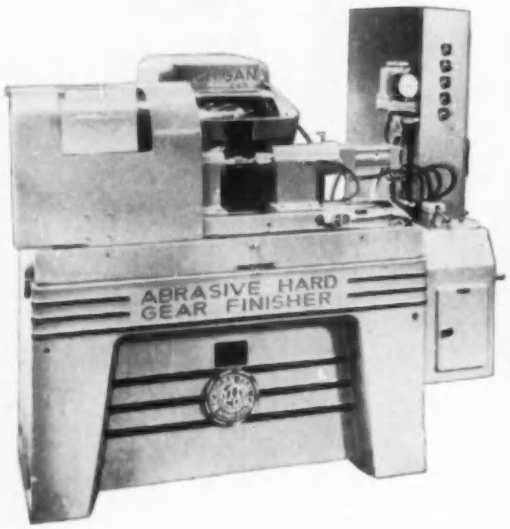
Circle 112 on Inquiry Card for more data

Gear Machines with the

You asked for

ABRASIVE HARD GEAR FINISHERS

that would give you...



1. Less gear noise at lower cost.
2. Better finish with freedom from nicks and form variations.
3. Infinitely variable adjustment over wide range of cutter speeds; positive setting to scale for constant honing pressure.
4. A full 5-inch stroke.
5. Ability to finish crowned and tapered gears; or produce small crowns and tapers.
6. Longer hone life.
7. Automatic dressing when needed.

The new Michigan 999 gives you all these things and more. Ask for Bulletin 999-60.

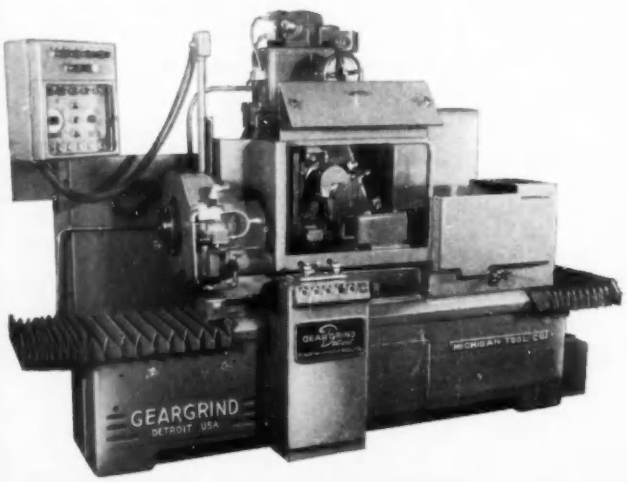
You asked for

FORM GRINDERS

that would give you...

1. Ability to grind either crowned (or uncrowned) spur or even spherical gears or splines.
2. Provision for automatic dressing and compensation for wheel wear when needed.
3. Automatic indexing and ability to rough, semi-finish and finish with one cycle setting or to operate machine manually.
4. A panel board to indicate continuously which portion of cycle is in progress.
5. Thermostatic control for hydraulic system (consistency).
6. Minimum maintenance plus J.I.C.

The new Michigan External Crown Gear Grinder gives you all this and more. Ask for Bulletin CGG-16x18FA.



MICHIGAN TOOL

Features YOU wanted...

You asked for

UNIVERSAL DEBURRING MACHINES

that would ...

1. De-burr and chamfer entire contour of both ends of gear teeth at high speed, with . . .
2. Accurately adjustable grinding wheel pressure to control amount of chamfer.
3. Be automatic in operation, including wheel approach and retraction.
4. Be fast and easy to load.
5. Cut down safety hazards for operators.
6. Have wheels and spindles operated by shop air controlled at the machine.

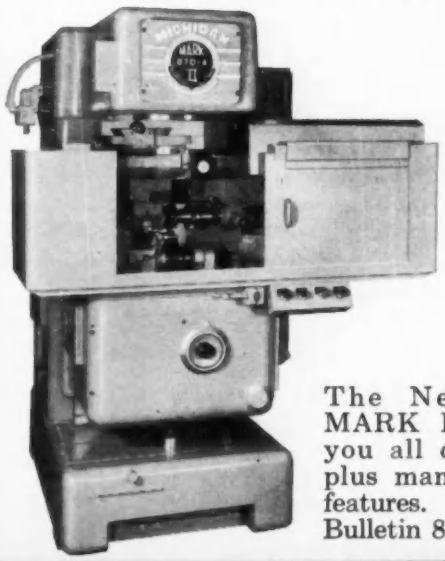
The new Michigan 482 (for bevel gears) and 482A (for spur and helicals) have all these features and many more. Ask for Bulletin by Model Number.

You asked for

GEAR FINISHERS

that would give you...

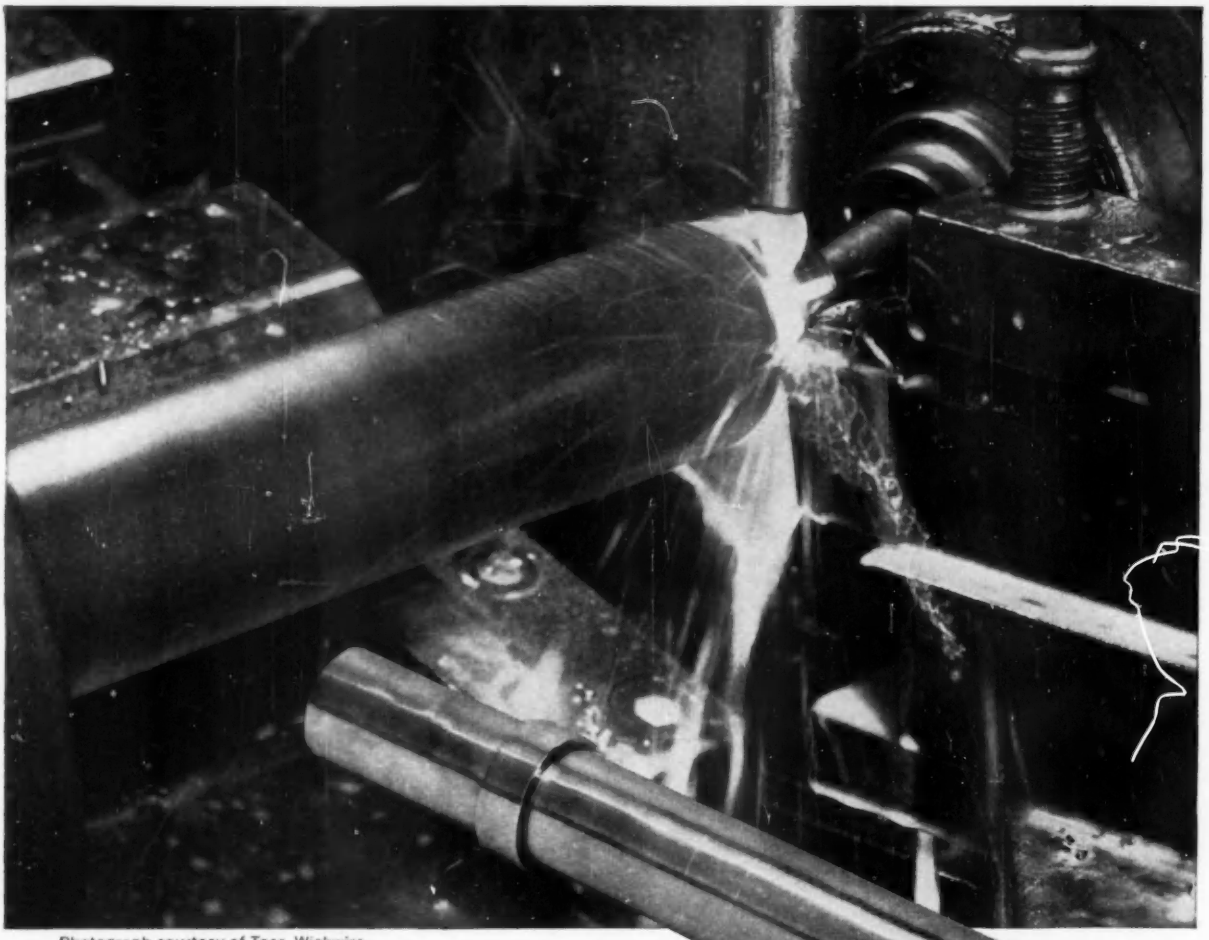
1. Full 5-inch stroke.
2. Real beef for rigidity combined with modular construction.
3. Ability to dial-in the setup for any gear within capacity of machine on external control panels.
4. A single attachment for crowning and tapering that can be locked out for spur gear shaving.
5. Adjustable (dial type) automatic upfeed and high range of traverse feed adjustment. Dial type cross-feed control.
6. Overload protection for cutters.
7. Heavy duty head and tailstocks protected against dirt and chips (accuracy).
8. Cycle-controlling dial type loaders.



The New 870 MARK II gives you all of these plus many other features. Ask for Bulletin 870-60.

COMPANY

7171 E. McNICHOLS RD.
DETROIT 12, MICHIGAN



Photograph courtesy of Teer, Wickwire

For a special kind of toughness

Teer, Wickwire picks Aristoloy 5115

These drive shafts have a rough life ahead of them. Used in the steering mechanism of trucks and heavy vehicles, they will be subjected to regular abuse and constant wear. This material, combining good carburizing potential and hardenability, results in a high strength core with excellent surface wear resistance.

If you have a special problem and would like assistance in selecting the right alloy for your job, call your nearest Copperweld representative or write us direct. We will be happy to study your problem—and to recommend the best alloy for your particular application.

For complete information about Aristoloy alloy, stainless and carbon grades send for NEW PRODUCTS & FACILITIES CATALOG.

ARISTOLOY STEELS

DIVISION OF
COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

Circle 114 on Inquiry Card for more data

NEWS

Vol. 124, No. 1 Jan. 1, 1961

AMC Rebate Stirs Action

Savings Bond Plan in Force for 5 Months

By Hugh C. Quinn, Detroit Regional Editor, and C. B. Campbell, News Editor

It's still too early to determine if American Motors' "progress sharing" rebate plan will boost Rambler or Metropolitan sales as intended, but the announcement of the ambitious program has generated plenty of activity in other areas.

American Motors' rebate plan could return $18.7 million in government savings bonds to customers, if sales climb 50 per cent over 1959 during the December-April period. The program was announced with a flourish Dec. 15 at a press conference in New York, but is retroactive to Dec. 1.

According to the plan, customers will receive a $25 bond if sales climb 10 per cent, a $50 bond if sales go up 20 per cent, a $75 bond for a 30 per cent increase, a $100 bond for a 40 per cent increase and a $125 bond if new car sales go up 50 per cent. The first sales report for December showed a two per cent increase in the first 10 days—up from 9885 a year ago to 10,084.

Plan Is Cumulative

The plan is cumulative, so that if the increase for December does not reach 10 per cent, December buyers can still collect on a later increase.

A 10 per cent rise for December would mean sales of 33,181 units and a 10 per cent increase for the four-month period would mean total sales of 143,694. A 50 per cent increase in December would take sales of 45,247 units. Payment of the maximum would require sales of 195,946 cars during the four-month span.

AMC president George Romney announced details of the plan at the New York meeting. In drama-

ISRAELI COMPACT WITH FIBERGLASS BODY

Introduced in New York City, Sabra station wagon, manufactured in Israel by Autocars, Ltd., has fiberglass body and four-cylinder 61 cu in. engine. Makers claim 43 mpg for Sabra and guarantee moving parts for 30,000 mi.

tizing the announcement, Mr. Romney called on charts and graphs that showed, among other things, that Rambler sales are up, farm incomes are down, automotive employment in Michigan is down, and Ford Motor Co. and General Motors have annual gross sales greater than the national revenues of most countries.

Criticizes 'Big Two'

Mr. Romney also criticized "excessive" foreign investment by the "Big Two" for production of parts and vehicles on a worldwide, rather than on a national, basis. He said that ownership on a 100 per cent basis, rather than on a partnership basis, "represents economic imperialism."

GM took issue within a matter of hours. An official statement pointed out that GM has actually expanded its operations in Michigan during the last decade, GM exports in 1960 exceeded imports 15 times, and GM overseas expansion has been strictly for the overseas market.

Some other results of Mr. Romney's announcement: A second meeting with the press to clarify and amplify his points, and to repeat and underscore his charges of "economic imperialism"; an immediate drop in the price of American Motors stock; announcement by Mr. Romney that Canadians will be permitted to buy stock and, "if they show interest," control in AMC's Canadian subsidiary; and revelation that the company is working on a follow-up to the English-built Metropolitan, which AMC "would like to build here," if costs were not so high.

For the record: In 1914 Henry Ford announced a rebate of $40-$50 if 12-month sales topped 300,000 units. They did, and Ford returned some $15 million to customers. And in 1960, Studebaker-Packard offered a $100 discount to shareholders who bought Studebakers during July, August and September.

LARGEST U. S. END DUMP TRUCK

Its dump bed towering over the heads of spectators, the "Western 80," demonstrates its ability to handle loads up to 220 tons in copper mining service in Utah. The 145-ton giant, 16 ft wide and 55 ft long, rides on 18 six ft high Goodyear tires. They contain enough rubber to make 1000 passenger car tires.

SAE Meets Jan. 9-13

The first SAE International Congress and Exposition of Automotive Engineering will be held Jan. 9-13 in Detroit's Cobo Hall, with some 25,000 expected from all parts of the world.

The same conclave, once called simply the "annual meeting," will feature 180 technical papers at 70 sessions; a 20,000 sq ft non-commercial exhibit called the Science Pavilion; a 180,000 sq ft engineering exposition by more than 200 companies; and a banquet, with GM president John F. Gordon as main speaker.

Everything will have an international flavor. It's the International Banquet (Jan. 11), the International Luncheon (Jan. 10—Paul G. Hoffman, speaker); and the International Exposition.

The Science Pavilion will feature such displays as an automatic highway, ride comfort measure, fuel and lubrication development, military vehicles, exotic materials, transportation, communications and traffic control.

2d Chevrolet Compact?

Chevrolet is expected to bring out another compact car in 1962—this one a front-engine car slightly larger than the current rear-engine Corvair. It would be powered by either a six or a four-cylinder in-line engine.

Recent Chevrolet plant expansions have added fuel to reports of a new vehicle. One report has it that all Corvair production will be pulled into the Willow Run plant outside Detroit. This plant is being expanded by 50 per cent.

Latest move announced by Chevrolet is construction of a new assembly plant on a 400-acre site at Fremont, Calif. This plant is slated for completion by the fall of 1962.

Chevrolet also announced recently a 77,000 sq ft expansion at Muncie, Ind. The division also is taking over two plants from the government, one near Buffalo and one outside Detroit.

Wright or Bugas?

Robert S. McNamara was president of Ford Motor Co. only 34 days when he resigned to accept the position of Secretary of Defense in the new Cabinet. Mr. McNamara cut all ties with Ford, resigning as a director as well, and selling all his Ford stock—about 24,000 shares.

Henry Ford II stepped back in as president, at least temporarily. The company probably will name a new president within a few months. Likely successors are James O. Wright, 48, vice president in charge of the car and truck group, or John S. Bugas, 52, vice president in charge of international operations.

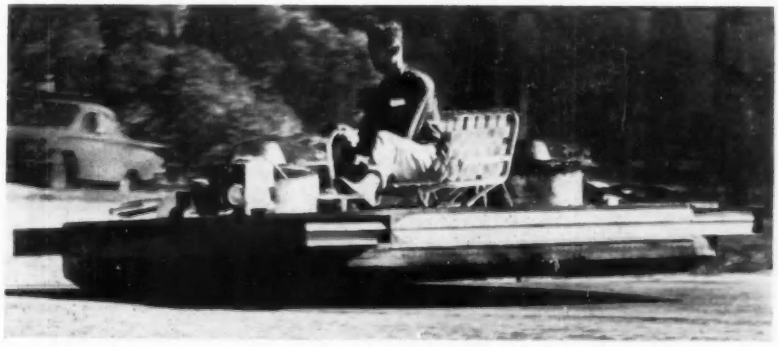
GMC Torque Divider

A device that prevents loss of power in both rear wheels when one is spinning on ice, mud or snow has been made available by GMC Truck & Coach Div. in its four-wheel-drive models.

Called Powr-Lok, the torque divider automatically shifts power to the rear wheel with the greater traction, increasing the efficiency of GMC's four-by-fours as much as 25 per cent under certain conditions.

The installation is offered as optional equipment at extra cost.

GENERAL MOTORS RESEARCH MACHINE



Experimental Ground Effect Machine (GEM) tested by General Motors Research Laboratories Engineering Development Department, skims over land (upper photo) and water (lower photo). Fore and aft fans driven by 15-hp engines produce sheet of air from an annular jet around bottom of vehicle.

NEWS

CONTINUED

M-F Sees Good Year

Crop prospects are encouraging for 1961 and Massey-Ferguson Ltd., expects a modest increase in North American sales, A. A. Thornbrough, president, told AUTOMOTIVE INDUSTRIES.

"Acquisition of the Landini Tractor Manufacturing Co. in Italy, and the introduction in 1961 of a new tractor from Massey-Ferguson's recently opened Beauvais plant in France, should strengthen M-F's competitive resources in the Common Market and Europe generally," Mr. Thornbrough said.

"In its overseas markets, Massey-Ferguson saw improvements in Germany and Australia, which largely offset sales reductions in the United Kingdom and France. Export sales were buoyant in Europe, Africa, Asia and Latin America, and the company's Perkins engine subsidiary expanded its operations in major market areas. There are no significant changes foreseen in this pattern of international sales.

"As for 1961, crop prospects are very encouraging and the company looks forward to a modest increase in its North American sales.

"The fourth quarter in the United States started slowly, reflecting the lower levels of the first nine months, but a strong October, marked by good movement at retail, helped considerably.

"Despite an air of uncertainty as the year opened, 1960 saw good crops in both Canada and the United States. As a result, North American farm income will likely be higher than expected, providing a good basis for 1961 prospects.

"The Canadian market was generally satisfactory throughout 1960, and for Massey-Ferguson it was one of the best in years for both wholesale and retail sales."

Michigan Tops Output

Michigan continues as the production center of the automobile industry. In 1960 it increased its production lead to 30.9 per cent of total U. S. output, but still lagged behind the 34.3 per cent in 1957.

Following are production percentages of each state for the last four years:

	1960	1959	1958	1957
Michigan	30.9	28.3	29.9	34.3
Missouri	10.8	7.9	8.7	7.8
Wisconsin ...	10.8	10.3	7.6	4.8
California ...	8.9	8.5	10.1	10.2
New Jersey ..	6.5	6.5	6.2	6.8
Ohio	6.4	5.5	2.9	2.4
Georgia	4.6	5.8	5.3	5.2
Delaware	3.8	3.8	3.2	1.8
New York ...	2.9	3.3	4.7	4.7
Maryland	2.3	2.9	3.3	2.7
Indiana	2.1	3.9	3.8	3.6
Texas	2.1	2.7	3.0	3.5
Kansas	1.8	2.1	2.1	1.9
Illinois	1.4	1.9	1.6	1.7
Minnesota ...	1.2	1.7	1.4	1.5
Kentucky ...	1.0	1.4	1.6	1.6
Pennsylvania .	0.9	1.5	1.3	1.3
Massachusetts.	0.8	0.8	1.4	1.6
Virginia	0.8	1.2	1.0	1.2
Tennessee ...	0	0	.9	1.4

New GMC Truck Models

A new family of tandem trucks with 105-in. conventional cabs has been added to GMC Truck's full line of construction-type vehicles.

Four basic models are available, the WV5000 and WA5000 and the WV5500 and WA5500. "WV" models have vacuum brakes while "WA" versions come with air brakes.

Standard gross vehicle weights (truck, body and load) are 35,000 pounds for the W5000 and 43,000 for the W5500s. Optional heavy-duty axles may be used to boost GVW ratings to 45,000 and 48,000 lb.

NEWEST PRODUCT OF BRITISH AUTO MAKER

The Nobletta, a three-wheel weather-protected scooter, is in production by York Noble Industries, Ltd. It is powered by front-mounted Sachs two-stroke engine. The Nobletta has three forward gears and cruises at 35 mph.

News about

B.F.Goodrich Chemical *raw materials*

Inset shows Hycar sleeve with tube to discharge fuel leakage for B-58 "Hustler" bombers manufactured by Convair Division of General Dynamics Corporation. Immel Engineering and Development Company, Dallas, molds the sleeve of Hycar nitrile rubber supplied by B.F.Goodrich Chemical Company.

B-58's mid-air refueling hazard reduced by Hycar

As a safeguard against leakage of volatile jet fuels, each B-58 Hustler uses sleeves made of Hycar nitrile rubber around the connection with the tanker plane's fueling pipe. Each sleeve has a tube that escorts any leaked fuel out of the plane—safely away from danger.

The flexibility of rubber is needed for this sleeve, but many properties ordinary rubber can't provide are also needed. That's why Hycar was chosen. Tough and long-lasting, it retains its flexibility even at low temperatures of high altitudes. And it is highly resistant to change when exposed to all types of petroleum base fuels.

Here's another unusual performance problem solved by Hycar. It may help you solve a problem, make possible a new application, or even a new product. For information, write Dept. MK-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada Kitchener, Ontario.

Hycar
REG. U.S. PAT. OFF.
Rubber and Latex

B.F.Goodrich Chemical Company
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B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Circle 115 on Inquiry Card for more data

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.

Methods of Carburizing Alloy Steels

Carburizing is a means of impregnating the surface of steel with carbon, usually to very limited depths. Its purpose is to provide a hard, wear-resisting "case," or outer shell. Alloy steels, correctly handled, can be case-hardened without sacrificing desirable core properties.

There are three types of carburizing in general use:

Liquid Carburizing—The medium here is a hot-salt bath composed basically of cyanide compounds. The steel is immersed in the bath, the period of immersion depending upon the analysis of the steel and the depth of case desired. Liquid carburizing is a convenient method of producing thin, hard, wear-resisting cases, generally within the depth range of 0.02 to 0.03 in. However, deeper cases may be obtained, the actual depths depending upon economics and end uses.

Gas Carburizing — This method employs a furnace in which a carbonaceous atmosphere is created; i.e., gases that are high in carbon components, or those containing carbon. Steel subjected to gas carburizing can be case-hardened to depths generally ranging from 0.01 to 0.04 in. When quenching takes place immediately after carburizing, distortion can be kept to a minimum.

Pack Carburizing — Where the pack method is used, the parts to be carburized are buried in a container of dry carbonaceous materials. The container is sealed tight to prevent the infiltration of air, placed in a furnace and kept there for eight hours or more, the actual time depending upon the depth of case desired. Pack carburizing is particularly suitable where a deep case is essential (0.06 in. and over), although medium cases in the 0.04-to-0.06-in. range are possible.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Circle 116 on Inquiry Card for more data

NEWS

FEATURES

'61 Outlook Called Good

Industry Experts List Excellent Signs

There may be some disagreement on the details, but there is general accord among automobile makers on the basic proposition that 1961 will be a good year for the auto industry. There probably won't be any outstanding records set, but it's fairly well agreed that the bottom won't fall out of the auto business.

The experts point to the usual good signs: increased consumer spending, higher gross national product, ease of credit, more cars of trade-in age, greater number of multiple-car families, good acceptance of '61 models, etc. And this year, a new factor is being cited: the wartime bumper baby crop is beginning to reach the car-buying age.

Encouraging Predictions

The most optimistic prediction comes from General Motors. Frederic G. Donner, GM board chairman, is sticking with his earlier statement that new car demand may reach a level of seven million units in 1961 if consumer incomes continue to rise and consumer confidence is sustained. Even so, GM believes sales will reach 6.8 million units, including imports.

Ford is not quite so bullish in its viewpoint, but by no means is Ford afraid of the new year. Ford's prediction: 6.5 million units, including imports.

"The general business outlook suggested no drastic changes in the foreseeable future toward either a boom or a bust," stated Robert J. Eggert, marketing research manager for Ford's marketing staff. "Auto industry sales have been consistent with replacement needs and gradual expansion in car ownership."

In other words, sales are just about what they should be.

Mr. Eggert added that October and November sales were at a "seasonally adjusted annual rate of 6.75 million units," indicating that the public is pleased with the 1961 offerings of the auto makers. This rate would mean an increase in

(*Turn to page 25, please*)

AMPHIBIOUS 'GO-DEVIL'

Huge log proves no obstacle to machine built by Wagner Tractor Inc., Portland, Ore. Each wheel, equipped with Goodyear tractor tires, is mounted on leg which can be vertically orbited a full 360 degrees. It can climb banks seven ft high and cruise in deep water. Longitudinal hinge, connecting both ends of the two-part chassis, enables the machine to turn.

TABLOID

Russian research in solid state physics is growing at so swift a pace that the rate of Soviet publication in this field probably will surpass that of the U. S. in five to 10 years. This is the conclusion reached in a summary and evaluation of available information prepared by a government agency.

* * *

Scientifically developed rubber trees that produce 10 times as much as ordinary trees have opened a new future for natural rubber growers. Goodyear Tire & Rubber Co. is replanting its estates in Sumatra, the Philippines and the Western Hemisphere with trees that yield as much as 3000 lb per acre.

* * *

Consumption of new rubber in the U. S. in October amounted to 125,675 long tons. This compares with 124,100 long tons consumed in the previous month.

* * *

Shipments of finished steel products direct from the mills during October totaled 4,943,623 net tons, the American Iron and Steel Institute reported. This compares with 4,983,228 net tons shipped during September and 1,419,297 net tons in October, 1959, during the steel strike.

* * *

Metallurgical and mechanical characteristics of eight high-purity titanium-base binary and ternary alloy systems are evaluated in an Air Force research report. Also available is a study of the phase relationships in 10 vanadium-base binary systems and seven vanadium-titanium base ternary systems.

* * *

Mill and foundry consumption of refined copper rose to 122,000 short tons in August. This was 65 per cent above the five-year low reached in July. Copper wire mills consumed 72,000 tons of refined copper in August. This was 80 per cent more than in the preceding month.

Shipment of 539 business and utility aircraft valued at $8.7 million during October was announced by the Aerospace Industries Association. This brought total shipments for the year to 6197 aircraft valued at $123.3 million.

* * *

Twenty-three studies for the Atomic Energy Commission in the fields of metallurgy and ceramics have been released for sale to industry and the public.

* * *

High strength steel forgings for high performance aircraft and missiles can now be made quickly and economically with a minimum of machining, according to two Air Force metallurgical research reports. One describes the development of precision, high-strength forgings in hot dies using a nickel-base alloy. The second discusses economical production of forgings from dies capable of operating at high temperatures and high pressures.

* * *

Advantages of a non-destructive relation time technique method for measuring the thermal diffusivity of thin and odd-shaped solids, use of a small grating spectrometer for investigating infrared absorption spectra to solve molecular structure problems, and the performance of an improved differential vapor pressure molecular weight instrument are discussed in three recent Air Force research studies.

* * *

Capital outlays abroad by U. S. companies in 1960 are expected to reach $3.9 billion, the Office of Business Economics has announced. This rate of foreign expenditure is slightly higher than the 1959 total, but substantially under the $4.8 billion peak in 1957.

* * *

The most practicable type of system for cooling the cabin and equipment of supersonic aircraft at high altitudes has been determined in recent Air Force research.

Stephen L. Noble has been named director of dealer relations, Plymouth Div. of Chrysler Corp.

Record Tire Sales?

Record replacement tire sales of 72 million units in 1961 are predicted by J. W. Keener, president, B. F. Goodrich Co., in a year-end statement regarding the business outlook for next year.

Exclusive of Iron Curtain synthetic rubber, world consumption of rubber next year should reach a record 3,800,000 long tons, Mr. Keener said. U. S. consumption, he added, will be about 1,555,000 long tons, about the same as 1960.

Business activity will continue near current levels through the first half of 1961, but is expected to swing upward in the second half, Mr. Keener said. The gross national product, he observed, is expected to reach an all-time high of $513 billion, $9 billion above 1960.

Synthetic rubber probably will continue to capture a larger share of the total rubber market, reaching 71 per cent in the U. S. and more than 37 per cent in the rest of the free world.

(*Continued from page* 23)
sales over 1960, if maintained throughout the coming year.

L. L. Colbert, Chrysler Corp. board chairman, has not veered from his earlier prediction of 1961 sales of 6.5-6.6 million units, even though Chrysler experienced some disappointments with its 1961 models, right after introduction. Specifically, the Lancer and Dart did not meet expectations, saleswise.

None of the car makers seems to be worried by the abnormally high field stocks of unsold cars—at least, the worry is not openly visible.

Bracing for Strike?

It could be that the auto industry is bracing itself for another strike next summer, this one in its own backyard. High inventories in September would strengthen the manufacturers' hands.

Labor experts in Detroit expect the short work-week to be one of the major demands. A four-day week, theoretically, would force manufacturers to boost their labor force by 20 per cent to maintain production at current 40-hour schedules.

Escalation, with possible revision of the current escalator clause, will be another important issue.

The contract talks, and their results, no doubt will be one of the major stories of 1961 in the automobile industry. Anything that affects the five giant automobile corporations, and some 1.1 million workers, is bound to be big. Automobile contracts also set the pattern for other industries.

Another big story in '61, although it won't have the same sledge hammer impact, will be compact cars.

The compacts made their big splash during 1959 and 1960, when eight new makes in the so-called compact class were introduced.

Fight for Survival?

But the real test comes during 1961, when the compacts are bumping into each other in their fight for recognition. And, in some cases, it may be a fight for survival.

As the new year begins, there are 11 compact cars on the market, all made in this country. Add to these at least two or three solid imports in the same size and price category, and it's getting crowded.

As 1960 closed, compacts were selling about 30 per cent of the market. This was below the optimistic predictions of a market share of 35 per cent and even higher.

Await Compact Story

The success of the compacts in 1961 will have a bearing on future plans. What, for instance, will happen to the "compact-compact" market now dominated, in this country, by German and French cars? And if this market holds up, will U. S. manufacturers jump in with both feet, as they did into the compact arena? And if they do come out with four-passenger cars, what will then happen to the present compact market?

The marketing specialist who can answer that one deserves more than the traditional $64.

Although Ford's minicar is still more than a year off, the company already is thinking about a first-year volume of 300,000 units. The front-wheel drive car is to be built in Germany.

Meanwhile, other manufacturers work quietly on their compact-compact cars. While Ford has been getting all the publicity (UAW Local 600, for example, has been calling to have the car built in Dearborn), GM is said to be pushing its counter plan. According to some Detroit sources, the GM compact-compact will be out ahead of the Ford product.

Ford's plan for building its four-passenger vehicle in Germany is not a fly-by-night decision perhaps aimed at confusing the competition. The plan seems to fit in with an overall blueprint for worldwide expansion on a grand scale.

Foreign Expansion

This worldwide growth at Ford and at the other auto companies, in fact, will turn out to be a third major news story in '61, along with the labor contracts and the compact car market. Ford, GM, Chrysler and American Motors all have indicated that they are looking beyond our shores for future growth.

The export business, of course, is not a postwar fad. Ford and GM, in particular, have long and successful histories of overseas operation. But 1961 will see a new, revitalized, activity abroad.

The auto companies look forward to a good year in 1961—"as good as 1960, or better," as one official put it. And they are anticipating further growth in the coming years. But sage economists realize that the real growth potential is overseas, where rapidly rising living standards are putting more people in reach of the automobile than ever before.

The companies realize that growth in the U. S. will depend largely on population growth and multiple-car ownership, since the ratio of population to cars is now about 2.5 to one. But in foreign countries, the surface has only been scratched.

Realignment at AMC

A new organization set-up at American Motors shows realignment of seven top executives and a more centralized operation which crosses over divisional lines. A third executive vice president and three additional vice presidents were named at the corporation's December board meeting.

Roy A. Abernethy, formerly vice president in charge of automotive distribution and marketing, became executive vice president responsible for automotive and appliance distribution and marketing. He also was elected a corporation director.

Roy D. Chapin, Jr., and Bernard A. Chapman continue as executive vice presidents, Mr. Chapin with responsibility for fiscal and international activities in both the automotive and appliance fields, and Mr. Chapman with responsibility for all automotive and appliance manufacturing, engineering, styling and procurement. Both are directors.

Three new veeps are John W. Raisbeck, vice president of sales operations; Richard T. Purdy, vice president and treasurer; and Donald P. Else, vice president and comptroller.

Joseph W. Eskridge continues as v.p. in charge of defense production, with the added duties of future product development for all corporation lines.

The top-level shifts give AMC a broader base for overseas expansion, since Mr. Chapin now has charge of not only the overseas subsidiaries and exports, but also the funds necessary for expansion. The realignment also brings a closer alliance between AMC's automotive and appliance operations, hinting at a possible consolidation of the two.

AMC Sales Top Billion

American Motors closed its fiscal year Sept. 30 with a profit of $48.2 million on net sales of $1057 million —first time in history the company's sales topped the billion-dollar mark.

Although sales were up 22 per cent from 1959, net earnings were down slightly. A year ago AMC reported a profit of $60 million, helped by a $10.8 million tax credit carry forward from the previous year. AMC paid taxes for only nine months last year.

AMC President George Romney said net earnings were affected by expansion costs and third-shift operation expense in the Automotive Div.; outlay of $12.5 million for premium steel during the steel strike shortage; and reduced appliance division earnings.

Factory sales of Rambler cars during fiscal 1960 amounted to 464,790 units, a gain of 25.8 per cent over 1959. To build these cars, Mr. Romney said, the company worked 38 Saturdays and maintained three-shift operations for 26 weeks. Payrolls reached $203.7 million as employment averaged a new high of 30,255 an increase of 19 per cent over the previous year.

Chicago Auto Show

The 1961 Chicago Automobile Show will be held Feb. 18-26 in Chicago's new $35 million lakefront McCormick Palace. Show officials bill the 53rd renewal as a $20 million show, with more than 400 domestic passenger cars and trucks and foreign cars on display.

The Chicago show is sponsored by local dealers through the Chicago Automobile Trade Association.

Auto Show in '62

The Automobile Manufacturers Association has voted to sponsor another National Automobile Show —but not until 1962. The AMA board of directors, impressed by the 1.4 million persons who crowded Detroit's Cobo Hall for the 43rd National Automobile Show last October, decided to stage another exposition in the giant hall in the fall of '62.

Reason for skipping 1961 was not given. The show was an annual event from its inception in 1900 to 1940, but it has been held only twice since World War II (1956, 1960).

The post-war shows, however, have dwarfed any of the earlier events, with bigger budgets and bigger crowds. To keep the show really big, the AMA might decide to make it a bi-annual event, doubling the time for between-show buildup.

200,000 VWs in '61?

Volkswagen hopes to sell 200,000 cars in the U. S. during 1961, according to J. Stuart Perkins, general sales manager for Volkswagen of America. VW registrations for 1960 are expected to reach 185,000, or nearly 40 per cent ahead of 1959.

NEW CHEROKEE IS FOUR-PASSENGER PLANE

Piper's low-wing is powered by 160-hp Lycoming engine and has cruising speed in excess of 130 mph. It is expected to be available early this year.

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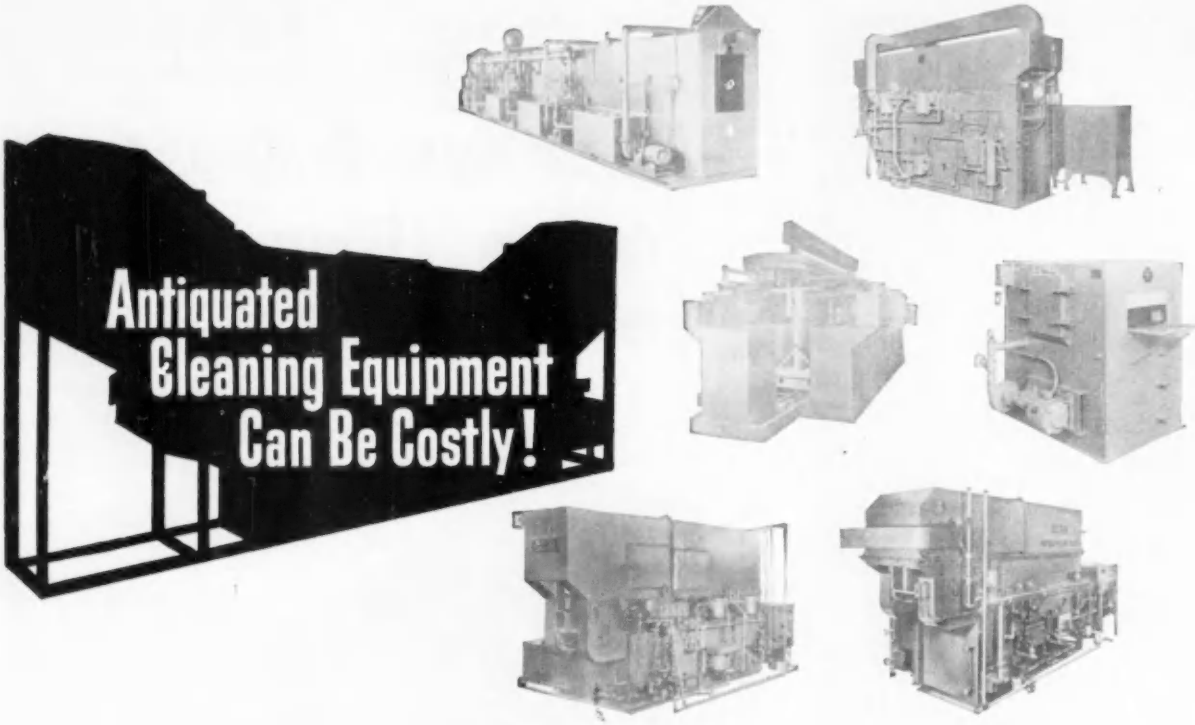

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MEN IN THE NEWS

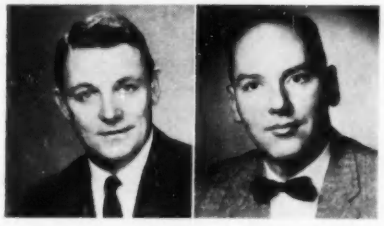
Eaton Mfg. Co., Marion Div. — Robert Gale has been promoted to purchasing agent.

Chilton Co.—James Alan Montgomery, Jr., has been elected secretary.

Warner Electric Brake & Clutch Co.—Hanz Winzer has been named managing director of Warner Electric, Ltd.

Chrysler Corp. — Walter B. Connolly has been appointed Stamping Group general plants manager.

Dana Corp. — Norman W. Kimmel has been appointed director of purchasing and production control.



Jones & Laughlin Steel Corp., Stainless and Strip Div.—Edward N. Nelson (far left) has been appointed product manager-carbon and coated strip steels. William Brenner, Jr., succeeds him as supervisor of quality control.

International Harvester Co.—**Duane F. Kuntz** has been named truck sales manager and **John C. Bulleit** has been promoted to manager, sales administrative services.

Gabriel Co., Gabriel Electronics Div. —**Peter Zitso** has been named manager of advertising and sales promotion and **Dale S. Harris** has been named manager of government sales.

Sperry Rand Corp., Vickers, Inc., Div. — **Douglas L. Heisler** has been named director of purchasing.

Eaton Mfg. Co., Fuller Mfg. Div.— **Paul E. Minsel** has been promoted to general manager, **Jerome Gensler** has been named manager of operations in Kalamazoo, and **Wayne Stone** has been named administrative assistant to the division manager.

Youngstown Sheet and Tube Co.— **Benjamin H. Pritchard** and **William B. Seemann** have been promoted to assistant purchasing agents.

Lapoint Machine Tool Co.—**George J. Bagnall** has been named vice president in charge of engineering and manufacturing and **William L. Gibbons** has been appointed factory manager.

Ford Motor Co.—**W. K. Barclay** has been promoted to executive assistant to the vice president-marketing.

Mack Trucks, Inc.—**Joseph I. Andreini** has been named operations manager for the Allentown, Pa. facilities.

Motor Wheel Corp. — **Robert G. Gulian** has been named director of employe and public information.

A. O. Smith Corp.—**John R. Parker** has been promoted to vice president, automotive and railroad products.

Jones & Laughlin Steel Corp., Stainless and Strip Div. — **Roderick S. O'Connor** has been named division manager of quality and process control.

Bendix Corp., Bendix-Pacific Div.— **David H. Brown** has been promoted to general manager.

Chrysler Corp.—**James C. Smith, Jr.**, has been appointed director of Advanced Projects Organization.

United States Rubber Co.—**Dr. Irwin J. Schaffner** has been promoted to senior research scientist at the Research Center.

Ford Motor Co., Ford Div.—**E. F. Laux** has been promoted to vehicle marketing manager.

Warner Electric Brake & Clutch Co.—**Paul A. Whaley** has been named works manager.

Studebaker-Packard Corp., ONAN Div.—**Robert L. Westrum** has been promoted to sales manager of new O. E. M. sales department.

Brooks & Perkins, Inc.—**P. B. Craighead** has been named manager of new Military Structures Div. and **G. R. Taylor** has been appointed project engineer for impact extrusion.

Goodyear Aircraft Corp.—**Carroll J. Peirce** has joined the office of Chief Engineer.

Necrology

Carl H. Bruestle, 58, manager of sales planning and analysis for Willys Motors, Inc., died Dec. 8 in Toledo, O. He also had worked for Chrysler Corp. and Kaiser-Frazer Corp.

George A. Lovett, 89, retired chief assistant to the director of General Motors Corp.'s patent section, died Dec. 5 in Urbana, Ill.

James P. Bender, 69, retired treasurer and director of Bethlehem Steel Co., died Dec. 4 in Limeport, Pa.

Allan C. Staley, 75, retired vice president of Chrysler Corp.'s Airtemp Div. and dean of the Chrysler Institute of Engineering, died Dec. 2 in La Jolla, Calif.

John D. Van Meenen, 50, factory manager of Willys of Canada Ltd., died Dec. 2 in St. Catharines, Ont.

Charles S. Monnier, 87, Detroit auto pioneer and operator of the world's first auto accessories store, died Nov. 29 in Royal Oak, Mich.

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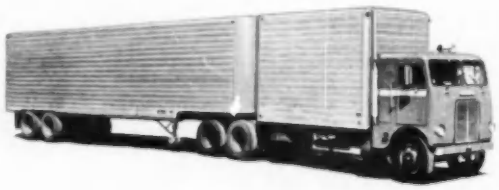

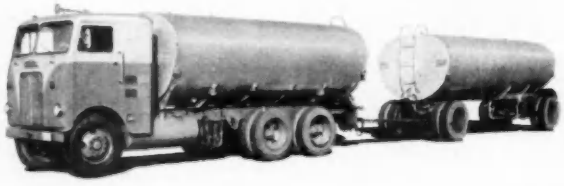

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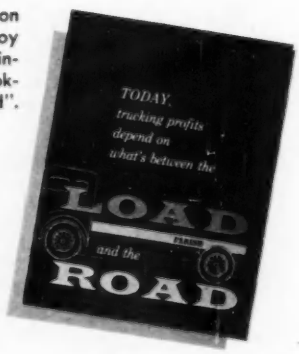

Circle 118 on Inquiry Card for more data

an Editorial

A Strong Outlook for 1961

THE OUTLOOK FOR 1961 for the major automotive vehicle producers and the major parts producers is stronger than many economic analysts have pointed out. Possibly a brief review of the financial status of the industry as it appeared before the opening of the New Year may be quite appropriate.

TAKING DATA AVAILABLE FROM principal reporting services for the period which included the third quarter for most companies, the industry, as represented by thirty-one leading companies, was in a very strong position. Out of twenty auto parts producers, thirteen had reported an all-time high in working capital. Of this group, seven reported all-time records in estimated gross sales for the entire year 1960. The number of companies whose stock had a net worth in excess of the market price on stock exchanges was ten. Despite the decreases in gross profit margins for the year, the average profit margin before taxes was more than 10 per cent. The lowest gross profit margin reported by any single company was 4 per cent. Ten companies had reported profit margins before taxes exceeding ten per cent.

AMONG THE ELEVEN automotive vehicle producers tabulated, eight reported record high working capital. Their average profit margin before taxes for the group, exceeded ten per cent. The number of companies with all time record sales in 1960 was four. The number of individual divisions with all time record highs in gross sales was considerably larger.

THESE FACTS POINT TOWARD substantial further growth of the industry in 1961, despite the widely reported economic recession. As 1960 came toward a close, the industry continued to break sales records, in some cases of single divisions, exceeding records of even 1955. It became clear that several major considerations would have to be faced by management in 1961. Improvement in earned profits must be planned. Improvement in reduction of manufacturing costs must be planned. On the whole, at the opening of 1961 it looks as if the industry has quite a substantial capability of achieving these objectives. But it would help if the new administration in Washington could cooperate in aiding 1961 improvement.

ONE STEP WOULD BE TO revise and reduce taxes. This is a step which is long overdue. Another step would be to further aid improvement of automotive industry exports. A third step would be to improve the basis for depreciation of costs of new equipment installations. Combined, these three actions would go far toward helping the industry to beat all previous records in both production and sales, as well as modernization of facilities during the coming year. Such steps would also be a strong stimulus to other industries to put expansion programs into effect immediately, thus helping the total national economy in a most significant way.

Hartley W Barclay

Editor and Publisher

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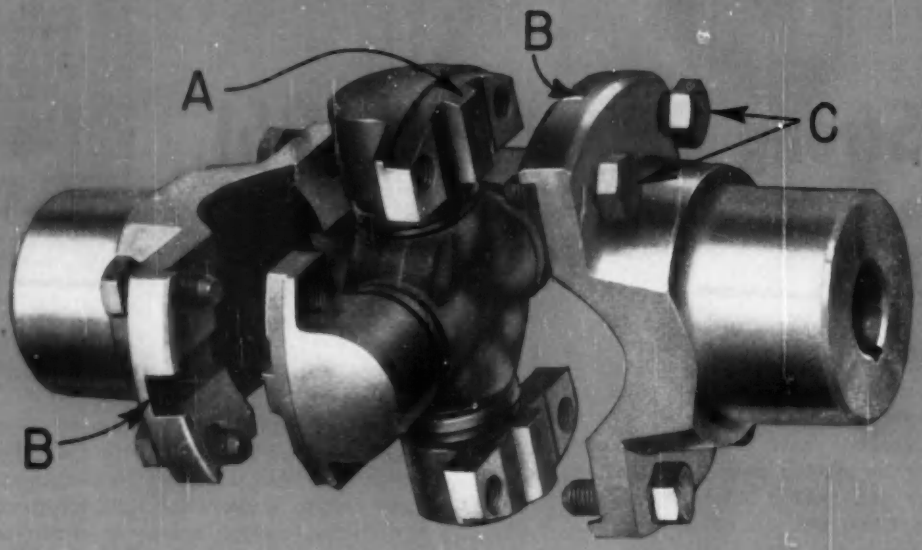

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Walker and staff aides Engle, Maguire, Bordinat and Oros gather for morning session to plan styling theme for new project

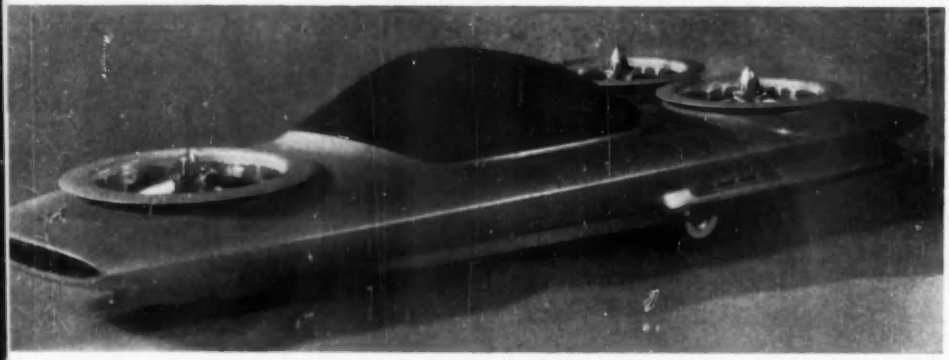
FORD STYLING ... AT WORK

By HUGH C. QUINN, Regional News Editor

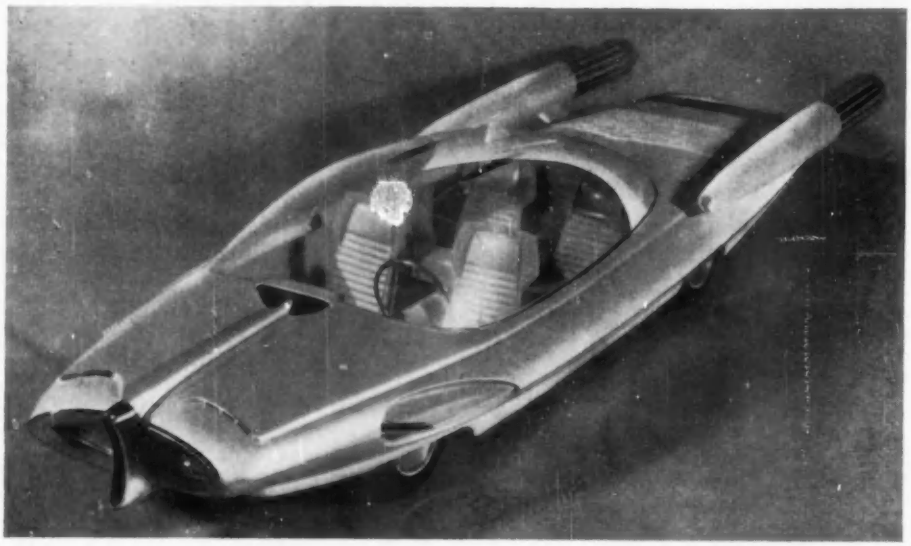
At first glance the room looks like something from a plush Fifth Ave. penthouse, as dreamed up by a Hollywood set designer. Soft, black mouton covers the floor from wall to wall. Modernistic sketches grace the off-white walls. A lattice-work false ceiling subdues the overhead light and conceals the air conditioning outlets. The hidden FM radio is tuned to soft, unobtrusive music. A knee-high round table—just the right height for a coffee table—is set before a semi-circular white leather settee. Two overstuffed white leather chairs punctuate the black and white color scheme. The windows are hidden behind floor length, gold-flecked draperies, and a well-stocked bookcase runs the length of one wall. Sleek, modern sculpture adorns the top of the bookcase. Tall white lamps carry the personalized monogram "G W W."

FORD STYLING . . . . . Continued

A 3/8 scale model of the "Nucleon" dramatically illustrates the stylist's concern for the future; design package is wrapped around an atomic powerplant



Ford Motor's "Volante" represents a concept for a multi-mission vehicle capable of operating both on the ground and in the air



Vertical bumper on X-2000 mock-up, above, appeared on 1958 Edsel as unique grille, right

Only the kidney-shaped desk, cluttered with correspondence, file folders, inter-office memos and scratch pads, belies the penthouse atmosphere. This, obviously, is a place of work, not relaxation.

This is the office where George W. Walker directs the complex and highly technical styling operation at Ford Motor Co. Any other office might be described as well decorated, or tastefully appointed, but Walker's office was styled, not decorated—styled with the same functional sense with which Walker and his staff style a Ford automobile.

The sketches on the wall and the sculpture on the bookcase, for instance, all represent ideas for vehicles, ranging from a scale model of the 1949 Ford passenger car to a delta-shaped vehicle that could evolve as a production automobile in the future. The low round table doubles as a conference table and impromptu drawing board for quick sketches by Walker and his assistants.

THE STYLING FUNCTION

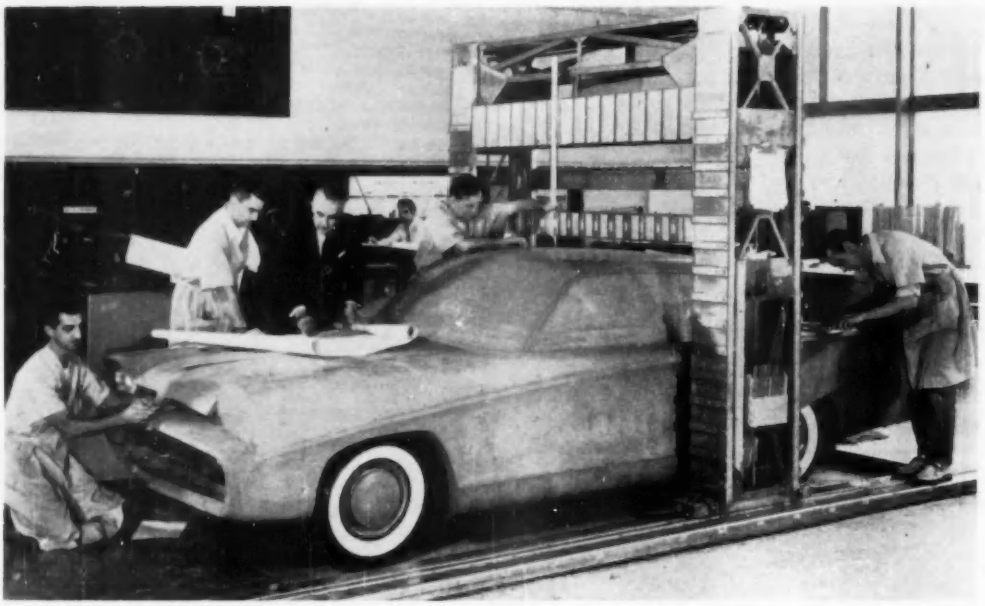
WALKER'S modernistic office underscores the tremendous importance placed on styling today by the automobile industry. The stylist is an integral part of the overall product planning and development program, working closely with management, cost analysis, engineering, manufacturing, purchasing and sales. The end result must be a car that will attract customers, and still remain within the rigid framework of technical and economic feasibility. It is not enough for a car merely to look beautiful—it must also fit the marketing plans of the sales department, the size and structural requirements of the engineers, and the mass production techniques available to the plants.

What good would it do, for example, to design an artistically beautiful automobile if it did not leave enough room for the engine, if its sheet metal contours could not be stamped, if it was too low for passenger comfort, and if it missed the target cost by $500? Such a car might win a prize at an art show, but it wouldn't win any support from the board of directors.

Walker believes that styling, more than anything else, is what sells cars today. He may be a little prejudiced, but he does have a valid point. In the modern automobile market, pricing is keenly competitive. Every vehicle is basically sound and reliable, and every vehicle offers good performance. The same features and accessories are available on any car

Design drawings and artist's renderings play vital role in visualizing new styling concepts

Full scale model of approved new design is molded in clay on wooden buck; from this model, precise measurements are taken for blueprints



Precise measurements are checked by modelers using aluminum bridge

Elwood P. Engle, staff stylist, and Mr. Walker discuss the hardware of a shrouded dream car

within a given price range, and the same general comfort is available everywhere. In short, any car on the market today is a good bargain at its price.

So it is the styling of one model, Walker contends, that sets it apart from the rest of the new cars, and it's the styling that ultimately influences the customer's decision.

The automobile industry recognizes the importance of styling in the overall success or failure of a product. Walker and his counterparts at General Motors and Chrysler—William L. Mitchell and Virgil Exner—all are corporation vice presidents.

STYLING STAFFS

THE automobile companies maintain huge styling staffs of specialists ranging from artists, draftsmen, and fabric experts to carpenters, engravers and metal workers. Styling departments have comfortable budgets to spend on "blue sky" projects that may never leave the studio. Entire advertising and sales campaigns are pegged to a new model's styling features. And stylists receive their share of random criticism from the motoring public.

During the 1930's the automobile companies stepped up their styling efforts as they searched for new methods to stimulate lagging sales. This was the period when such pioneers as Harley Earl and Amos Northrup came into prominence. Earl was the first

George W. Walker displays the X-1000 which shows the influence of aerodynamics on high performance automotive design

of the prolific stylists, in Walker's opinion, and Northrup was the man who first sought to create the feeling of movement in a car parked at the curb with his Graham-Paige Blue Streak. This was also the period when the well-conceived but ill-fated Chrysler Airflow car made its premature appearance—the first of the dream cars. And this was the period when industrial styling came into its own with new ideas and designs for household appliances, furniture, tools, machinery, and just about everything else you could name.

But it's just in the last 20 years that styling has become a potent market factor, Walker believes. Motion pictures, television and mass circulation magazines have made the public style-conscious to a point where they won't accept anything that is not good looking, regardless of how well it functions. Thus, styling no longer is subservient to functionalism. Instead, it is a part of functionalism.

To illustrate: a General Motors executive was once asked whether the three round identifying "ventiports" on the Buick's front fender are functional. He replied yes, they're functional in that they help sell cars.

STYLING SELLS CARS

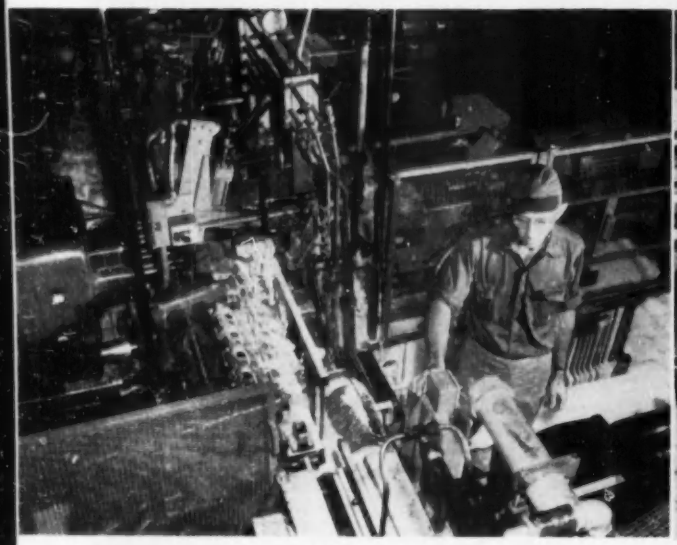
It was just this kind of functional styling—the kind that helps sell cars—that Henry Ford II was after when he approached George Walker in the fall of 1946. At that time, Ford Motor Co. was losing money at a fast clip, and Ford products, like the rest of the automobiles being built, were essentially pre-war cars. There had been no time to design anything new in the rush to supply pent-up demand when World War II ended, and the youthful head of Ford Motor Co. realized that a fresh new approach was needed to keep up with times. He wanted a postwar product, in a hurry.

Walker had his own industrial design studio in Detroit's New Center Bldg., and he had an automotive background that included design work for Peerless, Nash, Packard, Graham-Paige, and Willys. From a start as a fashion illustrator, Cleveland-born Walker had grown with the styling profession. His studio designed more than 3000 products for market—cars, radios, washers, refrigerators, alarm clocks, dispensing machines and countless others. He watched tastes and styles change, and he was ready with another change for Henry Ford. By December, 1946, he delivered the design for what was to be the 1949 Ford car.

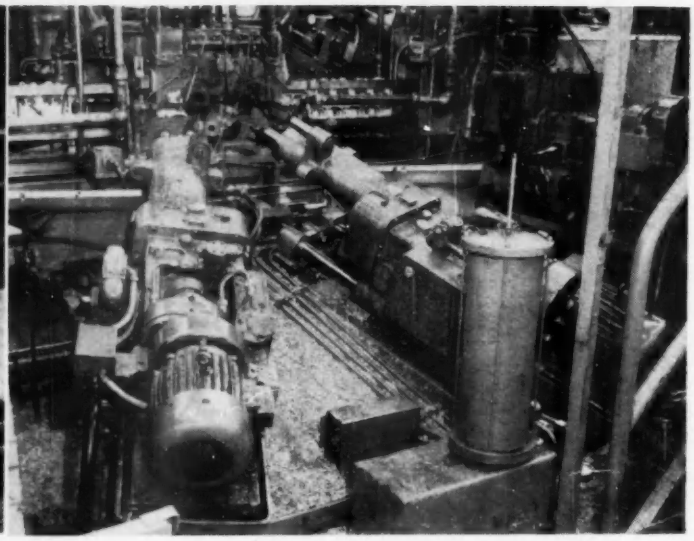
Through the 1948 models, Ford products were designed around a radius pattern, with plenty of rounded corners and edges. Walker's 1949 design launched what he fondly called the "crisp" concept, based on thin straight lines. The most notable departure of the '49 design placed the fenders as part of the body, and hence part of the overall design "package."

This crisp line has been refined and developed since then into the thin Galaxie roofline and deck lid

(*Turn to page 68, please*)



View of one section of the Foote-Burt transfer machine line.



Close-up of drilling station on Foote-Burt transfer machine line. This drills spark plug holes in an angular position.

Machining Operations on 1961 Oldsmobile Components

ALUMINUM CYLINDER HEAD

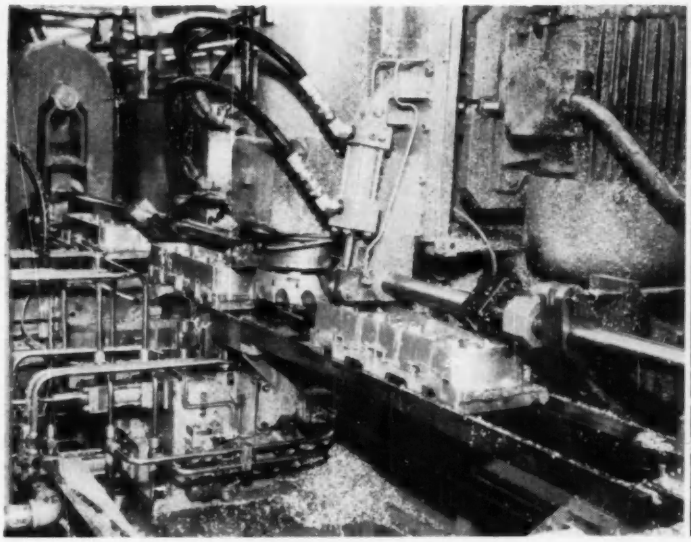
THE aluminum cylinder head is made by the semi-permanent-mold technique developed by the Central Foundry Division of General Motors, the one described here being designed specifically for Oldsmobile. Apart from the fully automatic machining cycle stemming from the transfer machines installed in this department, the most significant feature of the line is found in the selection of tools and tool forms, and speeds and feeds best suited to the specific alloy. Oldsmobile production engineers have learned through considerable experimentation that the specific alloy holds the key to machinability. Any change in the material specification may well require a major change in these factors.

Research also has uncovered the fact that the nature of chip formation is quite critical. The mass of aluminum chips, produced at high cutting speeds, tends to collect around the tools and ways and fixture surfaces, posing a major problem. This has been solved effectively by introducing massive cutting fluid flooding of tools and ways and fixtures under sufficient pressure to wash away the chips. When the transfer machines are in operation one will note particularly the enormous volume of cutting fluid over the entire extent of machining stations. Apparently the major function of the cutting fluid in this instance is to remove chips as they are formed. In fact, Oldsmobile estimates that about 80 per cent of the effectiveness of the cutting fluid is for this purpose.

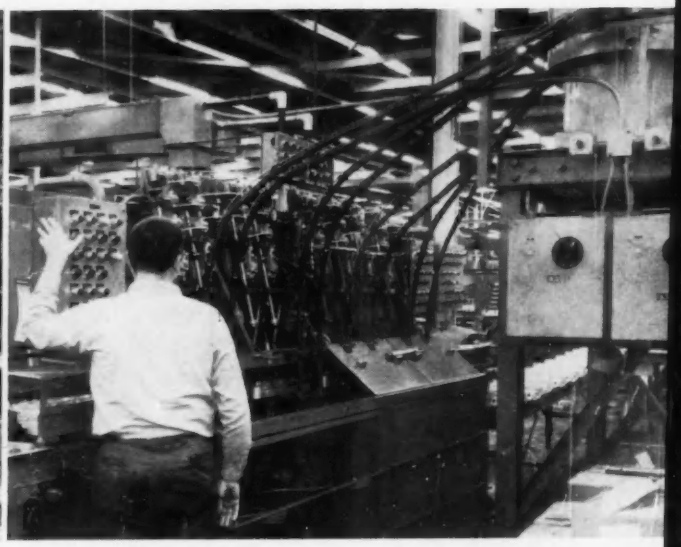
The part is finished in a continuous automatic cycle in a grouping of transfer machines. All of the outside surfaces and pads are finished by milling in a 7-station Snyder transfer machine. The cover face, exhaust bosses, and bolt bosses are milled first at the rate of 2075 sfpm with feed of 159-in. per minute. The joint face is milled at the rate of 2000-sfpm, while the intake is cut at 2075-sfpm. Both of the latter operations have a feed rate of 172-in. per minute. Oldsmobile tool engineers believe that ultimately such milling can be done at speeds of the order of two or three times the present rates.

From this stage the basic equipment is a two-section Foote-Burt transfer machine which completes all of the detail operations. The first section of this machine has 12 working stations with heads on both sides of the conveyor. It is an extremely compact machine for the nature of the operation.

Six end pads are milled at the start at the left hand head of Station 2, with a cutting speed of 1040-sfpm and feed rate of 60-in. per minute. The right hand head at this station drills 11 holes, three of them held to a depth of 1.62-in.,



Close-up of one of the Snyder high speed milling machines on the aluminum cylinder head line.



Valve guides and valve seat inserts are installed automatically in the 7-station Parker assembly machine shown.

PART II

By Joseph Geschelin

DETROIT EDITOR

and drills and countersinks one small diameter hole.

Station 4, LH head combination drills and countersinks eight holes in the intake pads at a cutting speed of 150-sfpm. The right hand head reams six holes in the joint face, drills four holes. Station 6, LH drills seven holes in the top face, drills and countersinks five small holes. The right hand head drills 14 holes in the joint face.

Station 8 LH, taps seven holes in the top face, taps eight holes in the intake pads. The right hand head chamfers and rough-drills the four spark plug holes. Station 10 LH, reams, counterbores, and countersinks two spark plug holes, while Station 12 RH does the same operation on the other two holes. Meanwhile, station 10 RH drills four ¼-in. holes in the joint face. The sequence is completed at Station 12 RH where the four spark plug holes are tapped for the 14-mm plugs.

The heads continue into the second section of the Foote-Burt machine where the eight valve guide holes are rough-drilled at Station 2 LH. Intake and exhaust holes are rough-counterbored, finish-bored and spot-faced in pairs to clear the tools, two alternate pairs being machined at Station 2 RH, the other pairs at Station 4 RH. Station 4 RH also spotfaces 14 holes on the top and intake side faces.

Four alternately spaced valve bores have the valve spring seats trepanned, and four holes are semi-finish-reamed at Station 6 LH, the same operations on the other valve bores being handled at Station 8 LH.

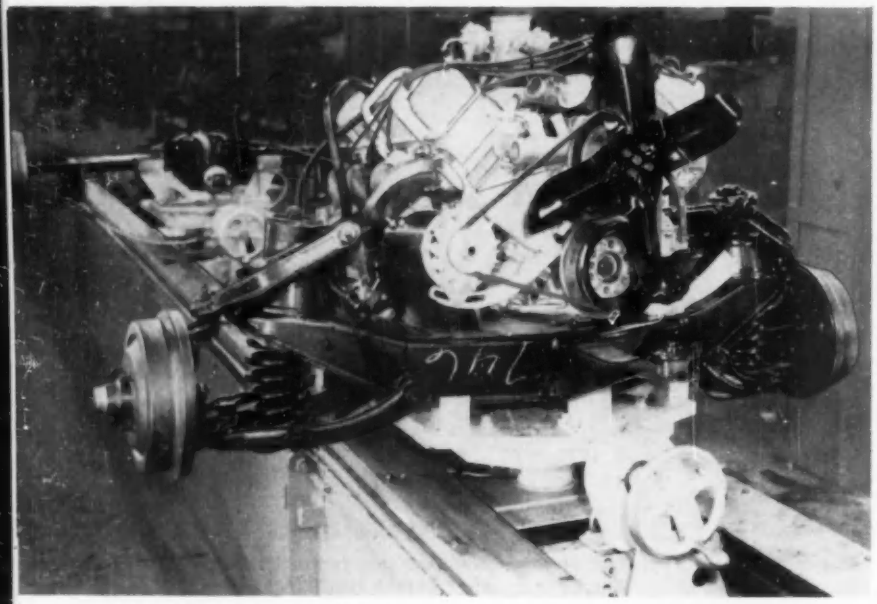
Station 6 RH and Station 8 RH finish-counterbore two pairs each of the intake and exhaust valve holes, while Station 10 LH finish-reams the eight valve guide holes. Six holes are counterbored in the exhaust joint face at Station 12 RH. Two holes in the end face are drilled one-inch deep and countersunk at Station 14 RH, tapped at Station 16 RH.

Incorporated in the transfer machine line is a seven-station Parker transfer machine for assembling valve guides and valve seat inserts. This is accomplished in a series of four alternating stages: insert valve seat inserts, two at a time from one side; insert valve guides, two at a time from the other side.

Following this is a 12-station W.F. & John Barnes transfer machine rebuilt for this operation.

Aluminum alloy cylinder heads for V-8 engines are being machined in large production numbers at Oldsmobile. This article is concerned with the equipment and methods developed for this purpose. Also included are some highlights of the procedure for fabricating the massive front cross member for the F-85 unitized body motor car.

Some of the illustrations pertinent to the machining of the cylinder head appeared in AI, September 15, 1960.



F-85 chassis assembly line. Here we see the massive front cross member which carries the entire front suspension system; and serves as a cradle for the power-plant.

Here Stations 3, 4, 6, and 7 RH gun-bore the valve guide and plunge-cut the valve seat, each head handling two holes. Station 9 LH then alternately taps four exhaust valve holes and four intake valve holes, drills six holes in the exhaust side. Station 11 LH deburrs the eight valve guides; taps the six holes on the exhaust face.

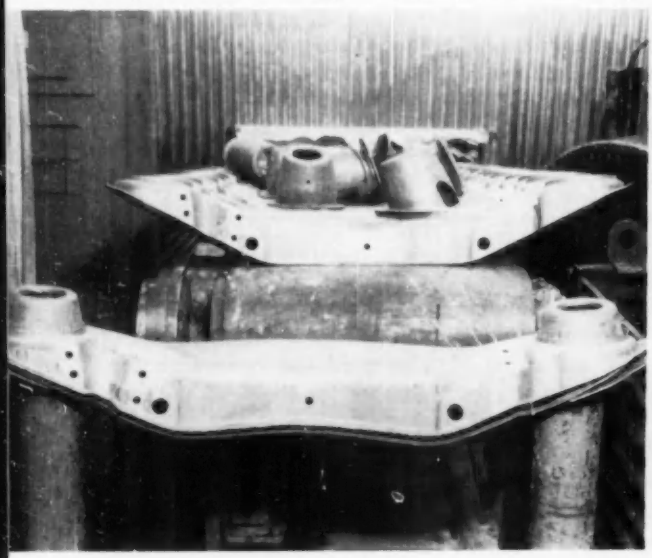
Final operation is the finish-milling of the joint face in a Snyder unit. It employs an 8-in. diameter milling cutter, cutting at the rate of 2000-sfpm with feed rate of 172-in. per minute. Thickness of the head is held to 3.824 in. plus or minus 0.001 in.

FRONT CROSS MEMBER

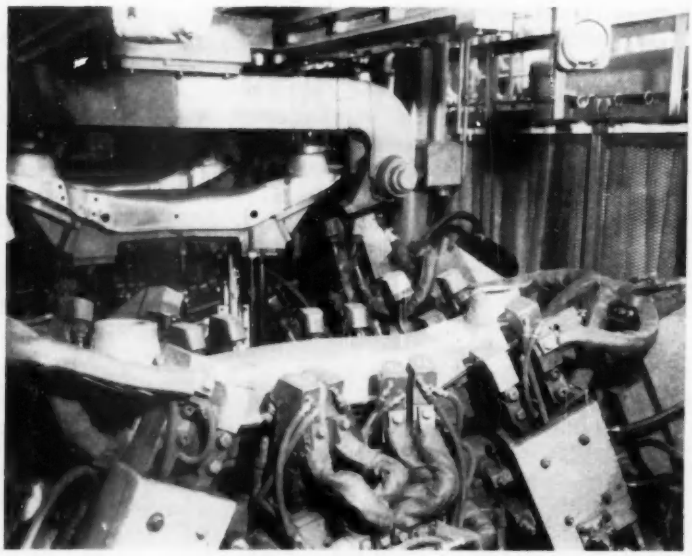
Let us shift now to the fabrication of the unique front cross member. This is a rather complex assembly of a variety of sheet metal parts winding up with a unit that has just about everything on it. The series of operations covered here include hand arc welding, machine spot welding, machine arc welding, CO_2 arc welding, hand tack and final hand arc welding. It is altogether a pretty complicated fabricated assembly.

As illustrated, it starts with the stamping of the cross member, the bottom reinforcement, and the two spring housings loaded on a fixture. This loose group of parts is transferred into the four-station Kirkhof automatic spot welding machine where 48 spots are welded. Major feature of this machine is found in the cycling of the welding heads. Instead of being in fixed positions the heads are individually controlled and move from their initial position into a number of positions, including a circular movement of four of the heads to handle a spot welding operation on the housing flange. While the cycling of the heads makes for complication in the mechanism of

First step in the fabrication of the F-85 front cross member. Component pieces are fed on the belt, reaching into the background. Parts required for initial assembly are installed loosely on fixture in foreground, ready for first welding.



Looking into the work station of the first Kirkhof spot welding machine. This shows something of the disposition of welding electrodes in the first station.



the machine, it facilitates the handling of closely-spaced welds in almost inaccessible locations in a very compact arrangement.

The next operation welds four lower arm bushings, two at the front, two at the rear. This is done in a two-station General arc welding machine. For this operation the assembly is tilted in the fixture, first for one end, then for the other to bring the bushings at each end into proper position for welding. Welding heads are rotated about the bushings to produce a secure seam weld.

Following this is a series of three operations in National Welders of CO_2 arc welding type. The first of these attaches the two engine front mounting brackets. The second unit welds on the two spring housings, while the third unit welds on the RH and LH upper bracket assemblies to the spring housings.

This is followed by hand-tack arc welding of side and front mounting brackets and bumper brackets, using portable CO_2 units, then hand arc welding to finish in an enclosed booth.

The final Christmas tree assembly is illustrated here to show what it looks like before going to paint. ■

Ceramic Exhaust Could Save Motorists Half Million a Year, AMC Aide Claims

The revolutionary new ceramic exhaust systems could ultimately save U. S. motorists more than a half million dollars a year in replacement costs, E. W. Bernitt, vice-president of American Motors Corp. automotive operations, said in Toledo, O.

Industry authorities estimate that 25 million mufflers and tailpipes are replaced every year at a cost of $500 million, he said.

Mr. Bernitt showed newsmen the unique process for ceramic-coating 1961 Rambler tailpipes and mufflers, developed in a cooperative program with American Motors, Walker Manufacturing Co. and The Bettinger Corp., whose Toledo plant coats the mufflers and tailpipes.

Newsmen also were given a graphic demonstration of how engine acids quickly destroy conventional car mufflers while having no effect on the ceramic-armored mufflers.

Mr. Bernitt showed a Rambler muffler and a regular muffler, both of which had been submerged for several months in a vat containing engine emission acids. The Rambler ceramic-coated muffler showed no deterioration, while the other was virtually destroyed.

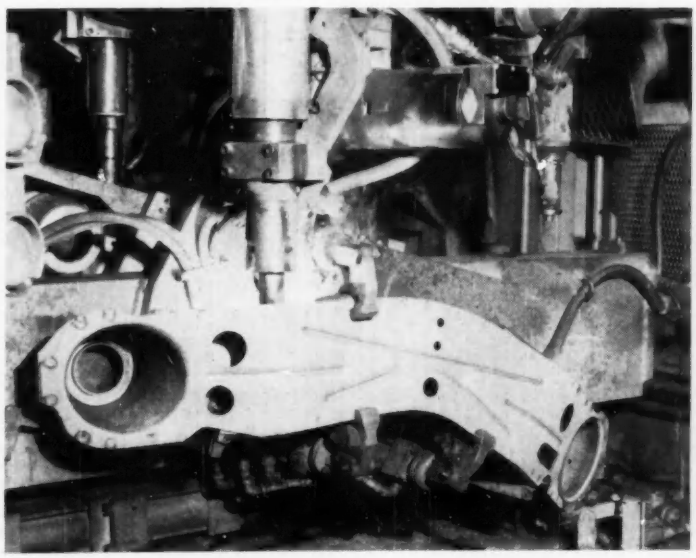
Mr. Bernitt said that independent tests indicate that conventional mufflers have an average lifetime of 18,000 mi, while an aluminized muffler — which also was pioneered by American Motors but replaced by the new unit —lasts an average of 34,000 mi.

Both the muffler and tailpipe are coated with ceramic through a process conceived originally for military jet engines by Bettinger.

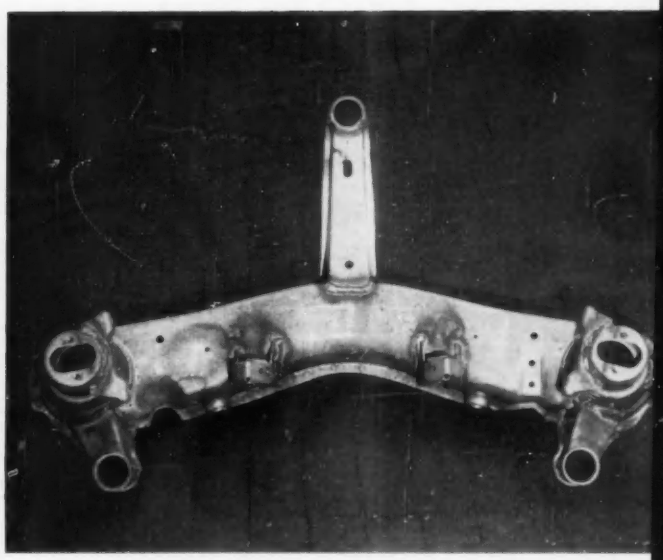
The specially designed mufflers are produced by Walker. After the ceramic coating is applied by Bettinger, Walker then completes the muffler with a layer of asbestos insulation and a corrosion-resistant zinc-coated cover.

The ceramic is applied by dipping the mufflers and tailpipes in a giant tank containing liquid ceramic. Thus, both the inner and outer surfaces are coated. The ceramic then is fused to the metal in a continuous furnace at a temperature of 1500 degrees F.

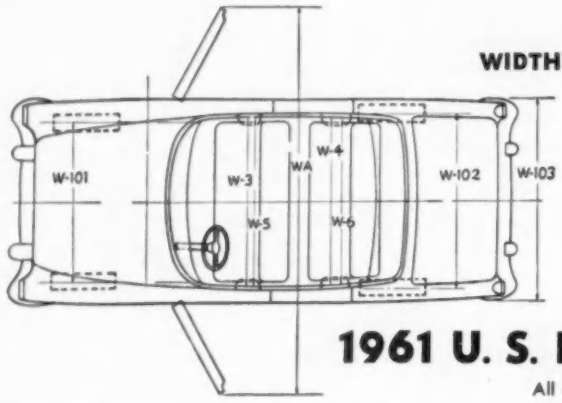
Lower arm bushings are welded in place in the General arc-welding machine seen here. Attention is drawn to the tilting of the cross member to bring the bushing on one side into alignment with the welding head.



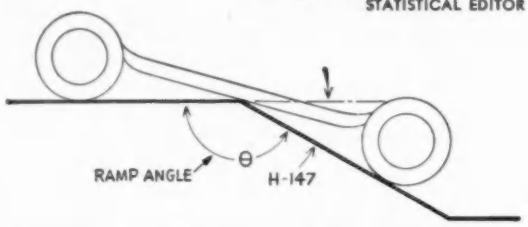
This view of the completely fabricated F-85 front cross member shows clearly the multiplicity of components that have to be integrated to make up the assembly.



1961 DETAILED PASSENGER CAR SPECIFICATIONS



. . . By Marcus Ainsworth
STATISTICAL EDITOR



1961 U. S. PASSENGER CAR BODY DATA

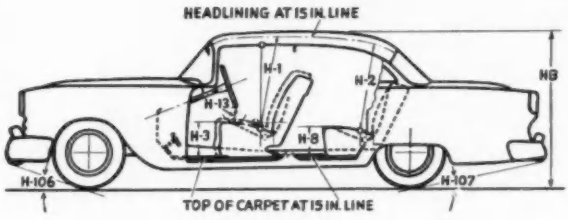
All dimensions apply to 5 or 6 passenger, 4 door sedan unless otherwise noted.

PASSENGER CAR MAKE AND MODEL	MISCELLANEOUS									GENERAL DIMENSIONS (Ins.)								
							Glass Area (Sq. In.)			L101	Overhang		Tread		Overall Dimensions			
											L104	L105	W101	W102	L103	W103	WA	HB
	Type of Finish	Hood Hinge Location	Hood Counterbalanced	Hood Release Control	Windshield Type	Rear Window Type	Windshield	Back Light	Side Glass	Wheelbase	Front—Including Bumper Guards	Rear—Including Bumper Guards	Front	Rear	Length—Bumper to Bumper	Width	Width—Doors Open	Height—Unloaded
AMERICAN MOTORS CORP.																		
Rambler American	E	R	Y	Ex	SC	C	838.0	571.0	1338.0	100.0	28.3	44.8	54.6	55.0	173.1	71.0	139.9	NA
Classic-6	E	R	Y	Ex	SC	C	1154.0	1236.0	1292.0	108.0	32.5	49.3	57.8	58.0	189.8	72.4	145.0	NA
Classic-8	E	R	Y	Ex	SC	C	1154.0	1236.0	1292.0	108.0	32.5	49.3	58.8	59.1	189.8	72.4	145.0	NA
Ambassador	E	R	Y	Ex	CC	C	1372.0	1238.0	1292.0	117.0	31.6	50.4	58.8	59.1	199.0	73.6	145.0	NA
CHECKER MOTORS CORP.																		
Checker Superba, Marathon	L	R	Y	Ex	C	C	944.0	816.1	1864.8	120.0	32.8	46.8	60.0	62.5	202.0	76.0	137.0	64.8
CHRYSLER CORP.																		
Chrysler Newport, Windsor	E	R	Y	In	SC	C	1575.0	1283.0	1186.0	122.0	34.8	58.8	61.0	59.7	215.6	79.4	154.1	56.8
New Yorker	E	R	Y	In	SC	C	1575.0	1283.0	1186.0	126.0	34.8	59.0	61.2	60.0	219.8	79.4	154.1	57.0
300-G[1]	E	R	Y	In	SC	C	1575.0	1778.0	1254.0	126.0	34.8	59.0	61.2	60.0	219.8	79.4	167.8	57.1
De Soto [2]	E	R	Y	In	SC	C	1575.0	1283.0	1230.0	122.0	34.8	58.8	61.0	59.7	215.6	79.4	154.1	56.8
Dodge Polara	E	R	Y	Ex	SC	C	1575.0	1344.0	1186.0	122.0	33.4	57.0	61.5	60.2	212.4	78.7	154.0	56.7
Dodge Dart Seneca, Pioneer, Phoenix-6	E	R	Y	Ex	SC	C	1575.0	1344.0	1148.0	118.0	33.4	58.0	61.5	60.1	209.4	78.7	154.0	56.4
Seneca, Pioneer, Phoenix-8	E	R	Y	Ex	SC	C	1575.0	1344.0	1148.0	118.0	33.4	58.0	61.5	60.2	209.4	78.7	154.0	56.7
Dodge Lancer 170, 770	E	R	Y	Ex	SC	C	985.0	919.0	1434.0	106.5	32.9	49.4	56.0	55.0	188.8	72.3	134.2	55.6
Imperial Custom[2], Crown[2]	E	R	Y	In	CC	C	1622.0	1479.0	1432.0	129.0	40.6	57.5	61.8	62.2	227.1	81.7	159.7	58.5
Le Baron[2]	E	R	Y	In	CC	C	1622.0	802.0	1432.0	129.0	40.6	57.5	61.8	62.2	227.1	81.7	159.7	58.5
Plymouth Savoy, Belvedere, Fury-6	E	R	Y	Ex	SC	C	1575.0	1344.0	1148.0	118.0	36.1	55.4	60.9	59.6	209.5	80.0	154.0	56.7
Savoy, Belvedere, Fury-8	E	R	Y	Ex	SC	C	1575.0	1344.0	1148.0	118.0	36.1	55.4	60.9	59.7	209.5	80.0	154.0	56.7
Valiant V-100, V-200	E	R	Y	Ex	SC	C	985.0	919.0	1434.0	106.5	29.2	48.0	56.0	55.5	183.7	70.4	134.2	55.6
FORD MOTOR CO.																		
Comet	E	R	N	Ex	C	FI	1232.0	893.3	1313.8	114.0	30.8	50.0	55.0	54.5	194.8	70.4	134.4	56.3
Falcon	E	R	N	Ex	C	C	1232.0	1145.0	1313.8	109.5	29.4	42.3	55.0	54.5	181.2	70.6	134.4	56.3
Ford Fairlane, Fairlane 500	E	R	Y	Ex	CC	C	1470.0	1607.0	1450.0	119.0	32.4	58.5	61.0	60.0	209.9	79.9	158.5	57.0
Galaxie	E	R	Y	Ex	CC	C	1470.0	992.0	1450.0	119.0	32.4	58.5	61.0	60.0	209.9	79.9	158.5	57.0
Lincoln Continental	E	F	Y	In	CC	C	1552.0	768.0	1320.0	123.0	36.5	52.9	62.1	61.0	212.4	78.6	146.9	55.1
Mercury Meteor 600	E	R	Y	Ex	CC	C	1470.0	1607.0	1450.0	120.0	33.8	60.8	61.0	60.0	214.6	79.9	158.5	57.0
Meteor 800, Monterey	E	R	Y	Ex	CC	C	1470.0	992.0	1450.0	120.0	33.8	60.8	61.0	60.0	214.6	79.9	168.6	57.1
Thunderbird [1]	E	R	Y	Ex	CC	FI	1473.0	1164.0	1177.0	113.0	38.2	53.8	61.0	60.0	205.0	75.9	170.1	53.9
GENERAL MOTORS CORP.																		
Buick Special	L	R	Y	Ex	CC	C	1236.6	1081.0	1322.1	112.1	31.0	45.3	56.0	56.0	188.4	71.3	136.1	53.1
Le Sabre, Invicta[2]	L	R	Y	Ex	CC	C	1604.3	1224.5	1339.6	123.0	32.5	57.7	62.0	61.0	213.2	78.0	141.0	56.8
Electra	L	R	Y	Ex	CC	C	1604.3	1466.6	1640.9	126.0	32.5	60.7	62.0	61.0	219.2	78.0	145.7	57.8
Electra 225	L	R	Y	Ex	CC	C	1604.3	1466.6	1640.9	126.0	32.5	60.7	62.0	61.0	219.2	78.0	145.9	57.8
Cadillac 60	L	R	Y	Ex	CC	C	1604.2	840.2	1519.4	129.5	33.5	59.0	61.0	61.0	222.0	79.8	145.9	.....
62, 63[2]	L	R	Y	Ex	CC	C	1604.2	1686.4	1440.4	129.5	33.5	59.0	61.0	61.0	222.0	79.8	145.9	.....
75	L	R	Y	Ex	CC	CC	1742.8	461.7	2081.0	149.8	33.5	59.0	61.0	61.0	242.3	80.6	154.7	.....
Chevrolet Biscayne, Biscayne	L	R	Y	Ex	C	C	1600.3	1338.0	1318.2	119.0	32.8	57.5	60.3	59.3	209.3	78.4	143.5	57.6
Fleetmaster, Bel Air, Impala	L	R	Y	Ex	C	C	1600.3	1338.0	1318.2	119.0	32.8	57.5	60.3	59.3	209.3	78.4	143.5	57.6
Corvair 500, 700	L	R	Y	Ex	CC	C	1122.8	1104.2	1154.7	108.0	30.3	41.7	54.0	54.0	180.0	67.0	130.1	53.0
900[3]	L	R	Y	Ex	CC	C	1122.8	1069.2	1027.2	108.0	30.3	41.7	54.0	54.0	180.0	67.0	145.4	53.0
Corvette [4]	L	F	N	In	C	FI	908.0	408.0	500.0	102.0	31.8	42.9	57.0	59.0	176.7	70.4	134.5	52.9
Oldsmobile F-85	L	R	Y	Ex	C	C	1293.0	1137.4	1439.5	112.0	30.5	45.7	56.0	56.0	188.2	71.5	138.7	54.3
88, Super 88	L	R	Y	Ex	CC	C	1668.3	1405.0	2852.8	123.0	32.6	56.5	61.0	61.0	212.0	77.2	141.1	57.5
98	L	R	Y	Ex	CC	C	1668.3	1467.3	3604.0	126.0	32.6	59.5	61.0	61.0	218.0	77.2	144.0	58.3
Pontiac Catalina	L	R	Y	Ex	C	C	1600.3	1338.0	1318.2	119.0	34.0	57.0	62.5	62.5	210.0	78.2	141.4	57.7
Ventura[2]	L	R	Y	Ex	C	C	1600.3	1224.0	1339.6	119.0	34.0	57.0	62.5	62.5	210.0	78.2	141.4	57.7
Star Chief	L	R	Y	Ex	CC	C	1604.3	1338.0	1318.2	123.0	34.0	60.0	62.5	62.5	217.0	78.2	141.4	57.6
Bonneville[2]	L	R	Y	Ex	CC	C	1604.3	1224.0	1339.6	123.0	34.0	60.0	62.5	62.5	217.0	78.2	141.4	57.6
Tempest	L	R	Y	Ex	C	C	1236.6	1081.0	1322.1	112.0	31.5	45.8	56.5	56.8	189.3	72.2	136.1	55.1
STUDEBAKER-PACKARD CORP.																		
Studebaker Lark (Deluxe and Regal)	E	R	Y	In	C	C	1112.0	1075.5	1208.2	108.5	26.4	40.1	57.4	56.6	175.0	71.4	135.4	56.5
Lark (Cruiser)	E	R	Y	In	C	C	1112.0	1064.2	1316.0	113.0	26.4	40.1	57.4	56.6	179.0	71.4	135.4	56.5
Hawk[1]	E	R	N	Ex	C	C	858.0	910.0	1098.0	120.5	34.9	48.6	57.4	56.6	204.0	71.3	153.3	57.8

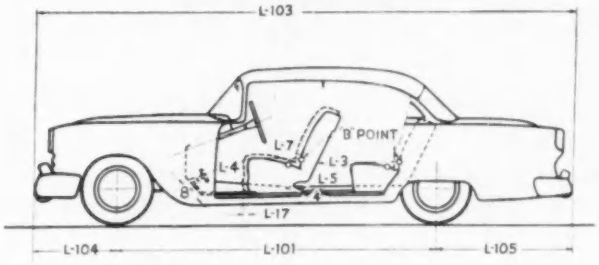
ABBREVIATIONS

1—Two door hardtop coupe.
2—Four door hardtop sedan.
3—Two door club coupe.
4—Two door convertible.
C—One piece curved.
CC—Compound curved.
E—Enamel.
Ex—External.
F—Front.
FI—One piece flat.
In—Internal.
L—Acrylic lacquer.
N—No.
NA—Not available.
R—Rear.
SC—Single curved.
Y—Yes.

HEIGHT DIMENSIONS



LENGTH DIMENSIONS



1961 U. S. PASSENGER CAR BODY DIMENSIONS

All dimensions apply to 5 or 6 passenger, 4 door sedan unless otherwise noted.

PASSENGER CAR MAKE AND MODEL	HEIGHT DIMENSIONS									WIDTH DIMENSIONS				LENGTH DIMENSIONS				
	Interior					Exterior				Interior				Interior				
	H1 Front Headroom	H2 Rear Headroom	H3 Front Cushion Height to Floor	H8 Rear Cushion Height to Floor	H13 Steering Wheel Clearance to Seat Cushion	H106 Angle of Approach—Deg.	H107 Angle of Departure—Deg.	H147 Ramp Breakover Angle—Deg.	H156 Minimum Road Clearance—In.	W3 Front Seat Shoulder Room	W4 Rear Seat Shoulder Room	W5 Front Seat Hip Room	W6 Rear Seat Hip Room	L3 Back of Front Seat to Rear Seat Back	L4 Leg Room—Front	L5 Leg Room—Rear	L7 Steering Wheel Clearance	L17 Adjustment of Front Seat
AMERICAN MOTORS CORP.																		
Rambler American	35.0	33.0	9.9	12.0	5.7	24.2	14.6	14.4	5.3 REC	51.5	49.8	58.0	45.3	25.4	44.0	37.5	14.2	6.0
Classic-6	36.0	34.5	10.0	13.9	5.9	21.0	13.9	13.6	5.6 EOP	57.7	57.6	59.8	60.1	26.7	43.0	40.0	13.8	6.0
Classic-8	36.0	34.5	10.0	13.9	5.9	21.0	13.9	13.6	5.4 REC	57.7	57.6	59.8	60.1	26.7	43.0	40.0	13.8	6.0
Ambassador	36.0	34.5	10.0	13.9	5.9	24.7	12.7	13.1	5.0 PS	57.7	57.6	59.8	60.1	26.7	43.0	40.0	13.8	6.0
CHECKER MOTORS CORP.																		
Checker Superba, Marathon	34.8	34.5	13.0	13.0	6.5	18.0	16.0	14.0	6.3 ES	59.0	57.2	62.3	52.5	42.6	42.0	48.0	15.0	5.0
CHRYSLER CORP.																		
Chrysler Newport, Windsor	33.3	33.6	11.4	13.0	6.3	16.0	10.5	12.4	5.2 M	60.3	59.6	63.8	62.8	30.3	45.1	42.4	15.5	4.5
New Yorker	33.3	33.6	11.9	13.0	5.5	16.3	10.7	12.4	5.5 M	60.3	59.6	63.8	62.8	29.9	45.3	42.4	15.8	4.5
300-G[2]	33.3	33.5	11.9	11.7	5.5	17.8	10.7	13.5	6.3	IS	IS	IS	IS	28.6	45.6	35.4	16.3	4.5
De Soto [3]	33.3	33.6	11.4	13.0	6.0	16.0	10.5	12.6	5.2 M	60.3	59.6	63.8	62.8	30.3	45.1	42.4	15.6	4.5
Dodge Polara	33.3	33.6	11.4	13.2	6.0	17.3	10.4	12.2	5.2	60.4	59.6	63.8	62.8	30.3	45.1	42.4	15.6	4.5
Dodge Dart Seneca, Pioneer, Phoenix-6	33.3	33.5	11.4	13.3	6.0	16.9	9.6	12.6	5.0 M	60.4	59.8	63.8	62.9	28.3	45.1	42.1	15.6	4.5
Seneca, Pioneer, Phoenix-8	33.3	33.5	11.4	13.3	6.0	17.0	10.2	12.6	5.1 M	60.4	59.8	63.8	62.9	28.3	45.1	42.1	15.6	4.5
Dodge Lancer 170, 770	33.6	33.1	11.2	13.7	6.4	23.3	12.3	11.6	5.4	54.0	54.1	56.8	56.9	27.9	42.8	39.8	15.2	4.5
Imperial Custom[3], Crown[3], Le Baron[3]	34.4	33.6	11.0	12.5	6.8	14.2	10.5	14.2	5.6 M	64.0	62.0	61.0	60.2	31.8	46.9	42.9	18.2	5.0
Plymouth Savoy, Belvedere, Fury-6	33.3	33.5	11.4	13.3	6.0	17.2	10.8	11.8	4.7 M	60.4	59.8	63.8	62.9	28.3	45.1	42.1	15.6	4.5
Savoy, Belvedere, Fury-8	33.3	33.5	11.4	13.3	6.0	17.7	11.1	12.6	5.0 M	60.4	59.8	63.8	62.9	28.3	45.1	42.1	15.6	4.5
Valiant V-100, V-200	33.6	33.1	11.2	13.7	6.4	21.5	13.1	11.6	5.4 ELT	54.0	54.1	56.8	56.9	27.9	42.8	39.8	15.2	4.5
FORD MOTOR CO.																		
Comet	33.8	32.7	11.4	14.2	5.5	23.3	12.8	12.8	5.9 RSA	55.3	55.1	57.0	57.0	27.1	43.3	39.4	13.0	4.0
Falcon	33.8	32.7	11.4	14.2	5.5	25.1	15.4	13.4	5.9 RSA	55.3	55.1	57.1	57.0	27.1	43.3	39.4	13.0	4.0
Ford Fairlane, Fairlane 500	33.5	33.9	9.3	13.1	5.2	21.4	11.6	11.5	5.5 RSA	59.9	61.2	62.1	63.5	31.8	43.3	41.6	12.8	5.5
Galaxie	33.5	33.9	9.3	13.1	5.2	21.4	11.6	11.5	5.5 RSA	59.9	61.2	62.1	63.5	31.8	43.3	41.6	12.9	5.5
Lincoln Continental	33.5	33.4	10.5	13.2	5.7	21.9	12.8	11.5	5.6 ES	59.4	59.1	59.7	60.7	28.1	44.2	40.3	14.8	5.5
Mercury Meteor 600	33.5	33.9	9.4	13.2	5.2	19.7	11.0	11.4	5.5	59.9	61.2	62.1	63.5	31.8	43.4	41.6	12.8	5.5
Meteor 800, Monterey	33.5	33.6	8.8	12.4	5.1	19.7	11.0	11.4	5.4	59.9	61.2	62.1	63.5	31.8	43.0	40.7	12.9	5.5
Thunderbird [2]	34.2	33.1	12.1	12.6	6.1	19.0	12.2	7.3	5.2 RSH	58.0	55.6	59.0	52.3	25.9	44.4	37.7	14.6	0.7
GENERAL MOTORS CORP.																		
Buick Special	34.0	33.6	10.8	12.2	5.1	26.5	16.7	12.3	4.9 FCP	55.2	54.6	58.6	58.2	26.7	44.0	37.9	13.6	4.2
Le Sabre, Invicta[3]	34.5	34.1	11.0	13.4	5.6	27.2	13.8	11.2	5.5 FCP	58.9	57.9	63.3	63.2	28.8	44.5	41.4	14.7	4.8
Electra, Electra 225	34.3	34.5	11.7	13.9	4.9	28.3	13.2	11.4	5.7 FCP	58.7	57.9	63.6	63.2	31.7	44.5	44.0	14.4	4.8
Cadillac 60	34.5	34.5	12.8	14.1	4.7	25.3	12.4	11.2	5.3	58.4	57.7	59.7	59.8	31.8	45.6	44.5	15.7	4.8
62	34.3	34.1	12.8	14.0	4.7	25.3	12.4	11.2	5.3	58.7	57.8	62.4	62.6	31.8	45.6	44.3	15.7	4.8
63[3]	34.3	34.1	12.8	14.1	4.7	25.3	12.4	11.2	5.3	58.4	57.8	59.7	59.8	31.8	45.6	44.5	15.7	4.8
75	35.4	34.4	10.1	13.2	5.6	27.7	13.7	11.1	6.2	60.5	58.8	65.5	60.1	28.0	44.2	.....	14.6	4.8
Chevrolet Biscayne, Biscayne Fleetmaster, Bel Air, Impala	34.5	34.0	11.0	14.0	5.0	27.0	13.0	11.0	6.0 M	59.0	58.0	63.5	63.5	29.0	45.0	42.0	14.0	4.5
Corvair 500, 700	33.5	33.5	10.0	11.5	5.1	27.0	16.0	16.0	6.0	54.0	53.5	58.5	58.0	25.5	44.0	36.5	15.0	4.0
900[4]	33.5	32.0	10.0	9.5	5.1	27.0	16.0	16.0	6.0	54.0	52.0	58.5	57.0	22.5	43.0	31.0	14.5	4.0
Corvette [5]	37.1	N	7.7	N	5.5	21.3	21.2	7.8	6.7	49.4	N	59.6	N	N	46.4	N	16.3	4.4
Oldsmobile F-85	34.0	33.6	12.4	11.9	5.2	27.3	17.2	16.2	4.9 RS	55.2	54.6	58.6	58.2	26.7	44.0	37.8	13.6	3.5
88	34.5	34.4	12.0	13.4	4.9	29.1	12.3	11.5	5.6 EM	58.9	57.2	63.3	63.3	28.8	44.4	41.4	13.8	4.5
Super 88	34.5	34.4	12.4	13.8	4.9	29.1	12.3	11.5	5.6 EM	58.9	57.2	63.0	63.2	28.8	44.4	41.4	13.8	4.5
98	35.2	34.4	12.4	13.8	4.7	29.7	11.6	11.3	5.8 EM	58.7	57.9	63.6	63.2	32.2	44.5	44.3	13.6	4.5
Pontiac Catalina	34.2	34.4	12.1	13.5	5.4	23.8	13.3	13.7	6.0 F	58.7	57.2	63.2	63.2	27.8	45.3	40.8	15.0	4.5
Ventura[3]	34.2	34.1	12.0	13.3	6.0	23.8	13.3	13.7	6.0 F	58.7	57.2	63.2	63.2	27.8	45.1	40.6	15.4	4.5
Star Chief	34.2	34.0	12.0	13.8	6.0	23.8	12.5	13.2	6.0 F	58.7	57.2	63.2	63.0	27.8	45.1	40.9	15.4	4.5
Bonneville[3]	34.1	33.8	12.0	13.8	6.0	23.8	12.5	13.2	6.0 F	58.7	57.2	63.0	63.0	27.8	44.9	40.9	15.1	4.5
Tempest	34.0	33.7	10.8	12.4	4.8	26.5	17.4	12.8	6.0	55.2	54.6	58.6	58.2	26.7	44.1	37.8	15.2	4.1
STUDEBAKER-PACKARD CORP.																		
Studebaker Lark	35.3	34.8	12.0	11.5	6.5	26.5	17.5	12.5	6.1 REC	55.5	54.5	59.5	59.0	29.0	43.5	40.0	13.8	5.5
Hawk	34.5	33.8	10.9	9.6	5.5	20.0	17.0	14.0	6.9 BFH	55.0	53.0	59.5	58.0	27.5	44.0	37.0	13.8	5.5

ABBREVIATIONS

[2]—Two door hardtop.
[3]—Four door hardtop sedan.
[4]—Two door club coupe.
[5]—Two door convertible.

BFH—Body front hinge pillar cross member.

ELT—Exhaust pipe, bottom of front longitudinals, and transmission cross members.

EM—At bolt head attaching right rear engine mount to frame.
EOP—Engine oil pan.
ES—Exhaust system.
F—Frame. **FCP**—Frame center plate.
IS—Not applicable, individual seats.

M—Muffler. **N**—None.
PS—Power steering support rod.
REC—Rear engine cross member.
RS—Rear shock absorber.
RSA—Rear suspension assembly.
RSH—Rear spring front hanger.

GENERAL ENGINE DATA, PISTONS

PASSENGER CAR MAKE AND MODEL	STANDARD ENGINE															PISTONS							
						Mounting Points												Clearance			Ring Groove Depth		
	Type	Valve Arrangement	Number of Cylinders, Bore and Stroke	Piston Displ.—Cu. In.	Compression Ratio (to 1)	Front	Rear	Taxable HP	Published Maximum BHP at Engine RPM	Published Maximum Torque (lb. ft. at RPM)	Recommended Idle Speed—RPM	Shipping Weight 5-6 Pass., 4 Dr. Sed.	Weight per Cu. In.[1]	Weight per Hp.[1]	HP per Cu. In.	Description and Finish	Weight—Oz. (Piston Only)	Top Land	Skirt		No. 1 Ring	No. 2 Ring	No. 3 Ring
																			Top	Bottom			
AMERICAN MOTORS CORP.																							
Rambler — American (Deluxe & Super)	IL	L	6-3 1/16 x4 1/4	195.6	8.00	2	2	23.44	90-3800	160-1600	550	2541	15.55	33.79	.460	Fh,So,Tp,Co	14.00	.0180	.0012	.0009	.1690	.1690	.1730
American (Custom)	IL	IH	6-3 1/16 x4 1/4	195.6	8.70	2	2	23.44	125-4200	180-1600	550	2594	15.82	24.75	.639	So,Tp,Co	14.70	.0180	.0012	.0009	.1690	.1690	.1730
Classic-6	IL	IH	6-3 1/16 x4 1/4	195.6	8.70	2	2	23.44	127-4200	180-1600	550	2915	17.46	26.89	.649	So,Tp,Co	14.70	.0180	.0012	.0009	.1690	.1690	.1730
Classic-8	V	IH	8-3 1/16 x3 1/4	250.0	8.70	2	2	39.20	200-4900	245-2500	550	3237	14.95	18.89	.800	Sa,Tp,Au	18.00	.0300	.0017	.0012	.1870	.1870	.1890
Ambassador	V	IH	8-4x3 1/4	327.0	8.70	2	2	51.20	250-4700	340-2600	550	3343	11.75	15.37	.765	Sa,Tp,Au	23.45	.0300	.0017	.0012	.1870	.1870	.1890
CHECKER MOTORS CORP.																							
Checker — Superba, Marathon	IL	L	6-3 3/16 x4 3/8	226.0	7.30	2	2	26.33	80-3100	180-1400	375	3320	16.90	47.75	.354	Fh,Cg,T,An	16.45	.0288	.0025	.0015	.1770	.1770	.1770[2]
CHRYSLER CORP.																							
Chrysler — Newport	V	IH	8-4 1/16 x2 7/8	361.0	9.00	2	1	54.30	265-4400	380-2400	500	3710	11.66	15.89	.734	Sa,St,E,Tp	25.30	.0450	.0010	.....	.2300	.2300	.2210
Windsor	V	IH	8-4 1/16 x2 7/8	383.0	10.00	2	1	57.80	305-4800	395-3000	500	3730	11.04	13.87	.796	Sa,St,E,Tp	27.20	.0450	.0010	.....	.2370	.2370	.2250
New Yorker	V	IH	8-4 3/8 x3 3/8	413.0	10.10	2	1	55.90	350-4600	470-2800	500	4055	11.03	13.01	.847	Sa,St,E,Tp	27.50	.0150	.0010	.....	.2340	.2340	.2230
300-G	V	IH	8-4 3/8 x3 3/8	413.0	10.10	2	1	55.90	375-5000	495-2800	750	4260	11.53	12.89	.908	Sa,St,E,Tp	27.50	.0150	.0010	.....	.2340	.2340	.2230
De Soto	V	IH	8-4 1/16 x2 7/8	361.0	9.00	2	1	54.30	265-4400	380-2400	500	.....	.....	.....	.734	Sa,St,E,Tp	25.30	.0150	.0010	.....	.2300	.2300	.2210
Dodge — Polara	V	IH	8-4 1/16 x2 7/8	361.0	9.00	2	1	54.30	265-4400	380-2400	500	3700	11.63	15.85	.734	Sa,St,E,Tp	25.30	.0150	.0010	.....	.2100	.2100	.2000
Dodge Dart — Seneca, Pioneer, Phoenix-6	IL	IH	6-3 1/16 x4 1/4	225.0	8.20	2	1	27.70	145-4000	215-2800	550	3335	17.04	26.45	.644	Sa,St,E,Tp	16.40	.0275	.0010	.....	.1790	.1790	.1810
Seneca, Pioneer, Phoenix-8	V	IH	8-3 7/16 x2 7/8	318.0	9.00	2	1	48.90	230-4400	310-2400	500	3515	12.63	17.46	.723	Hs,Sb,E,Tp	20.90	.0315	.0010	.....	.2100	.2100	.2000
Dodge Lancer — 170, 770	IL	IH	6-3 1/16 x3 1/8	170.0	8.20	2	1	27.70	101-4400	155-2400	550	2595	18.21	30.64	.594	Sa,St,E,Tp	16.40	.0275	.0010	.....	.1790	.1790	.1810
Imperial — Custom, Crown, Le Baron	V	IH	8-4 3/8 x3 3/8	413.0	10.10	2	1	55.90	350-4600	470-2800	500	4740	12.89	14.97	.847	Sa,St,E,Tp	27.50	.0450	.0010	.....	.2340	.2340	.2230
Plymouth — Savoy, Belvedere, Fury-6	IL	IH	6-3 1/16 x4 1/4	225.0	8.20	2	1	27.70	145-4000	215-2800	550	3310	16.93	26.26	.644	Sa,St,Tp,E	16.40	.0275	.0010	.....	.1790	.1790	.1810
Savoy, Belvedere, Fury-8	V	IH	8-3 7/16 x2 7/8	318.0	9.00	2	1	48.90	230-4400	340-2400	500	3465	12.47	17.24	.723	Hs,Sb,Tp,E	20.90	.0315	.0010	.....	.2100	.2100	.2000
Valiant — V-100, V-200	IL	IH	6-3 1/16 x3 1/8	170.0	8.20	2	1	27.70	101-4400	155-2400	550	2590	18.18	30.59	.594	Ss,St,E,Tp	16.40	.0275	.0010	.....	.1790	.1790	.1810
FORD MOTOR CO.																							
Comet	IL	IH	6-3 1/16 x2 1/2	144.3	8.70	2	1	29.40	85-4200	134-2000	525	2411	20.17	34.25	.589	Au,So,Tp	17.64	.0171	.0024	.0015	.1820	.1820	.1820
Falcon	IL	IH	6-3 1/16 x2 1/2	144.3	8.70	2	1	29.40	85-4200	134-2000	525	2289	19.33	32.81	.589	Au,So,Tp	17.64	.0171	.0024	.0015	.1820	.1820	.1820
Ford — Fairlane, Fairlane 500, Galaxie	IL	IH	6-3 5/8 x3 3/8	223.0	8.40	2	1	31.54	135-4000	200-2000	500	3585	18.32	30.26	.605	Au,So,Tp	19.25	.0185	.0028	.0015	.1853	.1853	.1853
Fairlane, Fairlane 500, Galaxie	V	IH	8-3 5/8 x3 3/8	292.0	8.80	2	1	45.00	175-4200	279-2200	500	3683	14.33	23.90	.599	Au,So,Tp	19.58	.0130	.0028	.0015	.1973	.1973	.1943
Lincoln Continental	V	IH	8-4 1/16 x3 3/8	430.0	10.00	2	1	59.17	300-4100	465-2000	475	4927	12.62	18.09	.698	Co,Se,Tp	29.80	.0191	.0025	.0012	.2271	.2271	.2086
Mercury — Meteor 600, 800-6	IL	IH	6-3 5/8 x3 3/8	223.0	8.40	2	1	31.54	135-4000	200-2000	500	3616	18.46	30.49	.605	Au,So,Tp	19.25	.0142	.0023	.0015	.2051	.2051	.2051
Meteor 600, 800; Monterey-8	V	IH	8-3 5/8 x3 3/8	292.0	8.80	2	1	45.00	175-4200	279-2200	500	3714	14.43	24.08	.599	Au,So,Tp	19.58	.0142	.0023	.0015	.2116	.2116	.2061
Thunderbird	V	IH	8-4 1/16 x3 3/8	390.0	9.60	2	1	52.49	300-4600	427-2800	500	3958	11.43	14.86	.769	Au,Ss,Tp	24.52	.0196	.0031	.0018	.1925	.1925	.1890
GENERAL MOTORS CORP.																							
Buick — Special	V	IH	8-3 13/16 x2 1/2	215.0	8.80	2	1	39.20	155-4600	220-2400	525	.....	.....	.....	.721	Cg,Ts,Ds	13.81	.0295	.0008	.0011	.1958	.1978	.1978
Le Sabre	V	IH	8-4 1/16 x3 3/8	364.0	10.25	2	1	54.45	250-4400	384-2400	525	.....	.....	.....	.687	Cg,Ts,Ds	22.24	.0330	.0011	.0026	.2150	.2175	.2200
Invicta, Electra, Electra 225	V	IH	8-4 3/8 x3 3/8	401.0	10.25	2	1	56.11	325-4400	445-2800	525	.....	.....	.....	.810	Cg,Ts,Ds	23.84	.0330	.0013	.0028	.2150	.2175	.2175
Cadillac — 60, 62, 63, 75	V	IH	8-4x3 7/8	390.0	10.50	2	1	51.20	325-4800	430-3100	480	.....	.....	.....	.833	Dt,Cg,Ct,Sc	22.56	.0345	.0015	N	.2080	.2080	.2080
Chevrolet — Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	IL	IH	6-3 7/8 x3 1/16	235.5	8.25	2	1	30.40	135-4000	217-2200	475	3495	16.96	29.59	.573	Fh,Ce	18.88	.0375	.0008	.....	.2020	.2020	.2020
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	V	IH	8-3 7/8 x3	283.0	8.50	2	1	48.11	170-4200	275-2200	475	3500	14.14	23.53	.601	Fh,Ss,Mr	20.40	.0390	.0008	.....	.2177	.2177	.2126
Corvair — 500, 700, 900	HO	IH	6-3 1/16 x2 1/2	145.0	8.00	2	1	28.40	80-4400	128-2300	500	2355	19.69	35.69	.552	Ss,Au	14.61	.0265	.0013	N	.1955	.1955	.1965
Corvette	V	IH	8-3 7/8 x3	283.0	9.50	2	1	48.00	230-4800	300-3000	475	2905	12.03	14.80	.813	Fh,Au,Mr,Ss	.....	.0375	.0008	.....	.2186	.2186	.2126
Oldsmobile — F-85	V	IH	8-3 13/16 x2 1/2	215.0	8.75	2	1	39.20	155-4800	210-3200	550	2566	14.26	19.78	.721	Cg,Tp	14.78	.0305	.0009	.0008	.1978	.1378	.1978
88	V	IH	8-4 1/16 x3 1/16	394.0	8.75	1	2	54.00	250-4200	405-2400	460	4024	11.48	18.10	.635	Au,Cg,Tp,St	27.76	.0310	.0015	.0010	.2160	.2160	.2060
Super 88, 98	V	IH	8-4 1/16 x3 1/16	394.0	10.00	1	2	54.00	325-4600	435-2800	460	4063	11.58	14.04	.825	Au,Cg,Tp,St	27.76	.0310	.0015	.0010	.2160	.2160	.2060
Pontiac — Catalina, Ventura, Star Chief	V	IH	8-4 1/16 x2 7/8	389.0	8.60	2	1	52.80	215-3600	390-2000	500	3720	10.86	19.63	.553	Cg,Ss,St,Tp	24.25	.0275	.0014	.0009	.2110	.2010	.1835
Bonneville	V	IH	8-4 1/16 x2 7/8	389.0	8.60	2	1	52.80	235-3600	402-2000	500	3895	11.30	18.70	.604	Cg,Ss,St,Tp	24.25	.0275	.0014	.0009	.2110	.2010	.1835
Tempest	IL	IH	4-4 1/16 x3 3/4	194.5	8.60	2	2	26.40	110-3800	190-2000	700	2800	16.97	30.00	.566	Cg,Ss,St,Tp	23.97	.0285	.0014	.0009	.2110	.2010	.1835
STUDEBAKER-PACKARD CORP.																							
Studebaker — Lark-6	IL	IH	6-3x4	169.6	8.50	2	2	21.60	112-4500	154-2000	550	2685	18.66	28.26	.660	Cg,Tp,T	10.60	.0173	SF	SF	.1635	.1485	.1685
Lark-8	V	IH	8-3 5/16 x3 1/4	259.2	8.80	2	1	40.60	180-4500	260-2800	550	2941	13.28	19.12	.694	Cg,Tp,Ts	16.21	.0195	SF	SF	.1938	.1938	.1938
Hawk	V	IH	8-3 5/16 x3 5/8	289.0	8.80	2	1	40.60	210-4500	300-2800	550	3205	12.82	17.64	.727	Cg,Ts,Tp	16.22	.0195	SF	SF	.1938	.1938	.....

ABBREVIATIONS

1—Shipping weight plus 500 lbs. for passengers, oil, water and gasoline.
2—No 4 ring, .1930; No. 5 ring, .1950.
An—Anodized.
Au—Autothermic.
Ce—Controlled expansion.
Cg—Cam ground.
Co—Conformatic.
Ct—Contoured top.
Ds—Divorced shirt.
Dt—Double "T" slot.
E—Elliptically turned.
Fh—Flat head.
Ho—Horizontally opposed.
Hs—Horizontal slot.
IH—In head.
IL—In line.
L—Valves at side.
Mr—Machined valve relief.
N—None.
Sb—Steel band.
Sc—Stannate coated.
SF—Selective fit.
So—Solid skirt.
Ss—Slipper skirt.
St—Steel struts.
T—"T" slot. Tp—Tin plated.
Ts—Transverse slot.
V—"V" type engine.

OPTIONAL ENGINE DATA

PASSENGER CAR MAKE AND MODEL	ENGINE									Exhaust System Type	CARBURETOR				IGNITION			AXLE RATIO (Standard)		Changes From Standard Engine
	Type	Valve Arrangement	Number of Cylinders Bore and Stroke	Piston Displacement—Cu. In.	Compression Ratio (to 1)	Published Maximum BHP at Engine RPM	Published Maximum Torque (Lb. ft. at RPM)	Operating Tappet Clearance			Make	Model	Number Used	Type	Distributor		Timing—Cls deg. @ RPM	Std. Transmission	Auto. Transmission	
								Intake	Exhaust						Make	Model				
AMERICAN MOTORS CORP.																				
Rambler ..... American (Deluxe, Super)	IL[1]	IH	6-3 1/2 x4 1/4	195.6	8.70	125-4200	180-1600	.012H	.016H	S	Hol	1908-FC	1	S	DR	1112434	8B.....	3.31	2.87	VA,CR,VC,Car,Dis,IT,AR
CHECKER MOTORS CORP.																				
Checker ..... Superba, Marathon	IL	IH	6-3 7/16 x4 5/8	226.0	8.00	122-4000	192-1800	.017H	.023H	S	Cart	AS-2858-S	1	S	AL	IAT-4406	3 1/2B-375	3.73	3.31	VA,CR,VC,Car,Dis,IT
CHRYSLER CORP.																				
Dodge ..... Polara	V	IH	8-4 1/4 x3 5/8	383.0	10.00	325-4600	425-2800	Hyd	Hyd	D	Cart	AFB-3152-S	1	FB	AL	IBS-4006-F	7 1/2B-.....	3.58	3.23	CR,Ex,Car,Dis,IT,AR
..... Polara	V	IH	8-4 1/4 x3 5/8	383.0	10.00	330-4800	460-2800	Hyd	Hyd	D	Cart	AFB-2903-S	2	FB	AL	IBS-4006-E	7 1/2B-.....	3.23	2.93	Car,Dis,AR
Dodge Dart ..... Seneca, Pioneer, Phoenix	V	IH	8-4 1/4 x3 3/8	361.0	9.00	305-4800	395-3000	Hyd	Hyd	D	Cart	AFB-3105-S	1	FB	AL	IBS-4006-F	10B-.....	3.31	3.31	Ex,Car,Dis,IT,AR
..... Seneca, Pioneer, Phoenix	V	IH	8-4 1/4 x3 5/8	383.0	10.00	330-4800	460-2800	Hyd	Hyd	D	Cart	AFB-2903-S	2	FB	AL	IBS-4006-E	7 1/2B-.....	3.23	3.23	CR,Car,Dis,IT,AR
..... Seneca	V	IH	8-4 1/4 x3 5/8	383.0	10.00	325-4600	425-2800	Hyd	Hyd	D	Cart	AFB-2968-S	1	FB	AL	IBS-4006-F	7 1/2B-.....	3.23	3.23	Car,Dis
Dodge Lancer 170, 770	IL	IH	6-3 1/16 x4 1/2	225.0	8.20	145-4000	215-2800	.010H	.020H	S	Cart	BBS-3098-S	1	S	Chr	1889750	2 1/2B-500	3.55	3.23	Car
Plymouth ..... Savoy, Belvedere, Fury	V	IH	8-4 1/4 x3 3/8	361.0	9.00	305-4800	395-3000	Hyd	Hyd	D	Cart	AFB-3105-S	1	FB	AL	IBS-4006-F	10B-.....	3.31	3.31	VL,Ex,Car,Dis,IT,AR
..... Savoy, Belvedere, Fury	V	IH	8-4 1/4 x3 5/8	383.0	10.00	330-4800	460-2800	Hyd	Hyd	D	Cart	AFB-2903-S	2	FB	AL	IBS-4006-E	7 1/2B-.....	3.23	3.23	CR,Car,Dis,IT,AR
..... Savoy, Belvedere, Fury	V	IH	8-4 1/4 x3 5/8	383.0	10.00	325-4600	425-2800	Hyd	Hyd	D	Cart	AFB-2968-S	1	FB	AL	IBS-4006-F	7 1/2B-.....	3.23	3.23	Car,Dis
..... Savoy, Belvedere, Fury	V	IH	8-4 1/4 x3 5/8	383.0	10.00	330-5200	425-3600	Hyd	Hyd	D	Cart	AFB-2790-S[2]	2	FB	AL	IBS-4006-F	7 1/2B-.....	3.23	3.23	Car
FORD MOTOR CO.																				
Comet	IL	IH	6-3 1/16 x2 7/8	170.0	8.70	101-4400	156-2400	.018H	.018H	S	Hol	1908	1	S	Fo	CIDF-12127-B	6B-500	3.20	3.20	Dis,AR
Falcon	IL	IH	6-3 1/16 x2 7/8	170.0	8.70	101-4400	156-2400	.018H	.018H	S	Hol	1908	1	S	Fo	CIDF-12127-B	6B-500	3.20	3.50	Car,Dis,AR
Ford ..... Fairlane, Fairlane 500, Galaxie	V	IH	8-4x3 1/2	352.0	8.90	220-4400	336-2400	Hyd	Hyd	SC	Fo	.....	1	D	F-H	COAF-12127-E	3B-500	3.56	3.00	CR,VL,Dis,AR
..... Fairlane, Fairlane 500, Galaxie	V	IH	8-4 1/16 x3 5/8	390.0	9.60	300-4600	427-2800	Hyd	Hyd	D	Fo	.....	1	FB	F-H	CISF-12127-A	3B-500	3.56	3.00	CR,Ex,Car,Dis
..... Fairlane, Fairlane 500, Galaxie	V	IH	8-4 1/16 x3 5/8	390.0	9.60	330-5000	427-3200	Hyd	Hyd	D	Fo	.....	1	FB	F-H	CISF-12127-A	3B-500	3.56	3.00	.....
..... Fairlane, Fairlane 500, Galaxie	V	IH	8-4 1/16 x3 5/8	390.0	10.60	375-6000	427-3200	.025H	.025H	D	Hol	.....	1	FB	Fo	COAA-12127-K	14B-700	3.56	N	CR,VL,VC,Dis,IT
Mercury ..... Meteor 600, 800; Monterey	V	IH	8-4x3 1/2	352.0	8.90	220-4400	336-2400	Hyd	Hyd	SC	Fo	.....	1	D	F-H	COAF-12127-A	3B-500	3.56	3.00	CR,VL,Dis
..... Meteor 800; Monterey	V	IH	8-4 1/16 x3 5/8	390.0	9.60	300-4600	427-2800	Hyd	Hyd	D	Fo	.....	1	FB	F-H	CISF-12127-A	3B-500	N	3.00	CR,Ex,Car,Dis
..... Meteor 600	V	IH	8-4 1/16 x3 5/8	390.0	9.60	330-5000	427-3200	Hyd	Hyd	D	Fo	.....	1	FB	F-H	CISF-12127-A	3B-500	3.56	3.00	.....
GENERAL MOTORS CORP.																				
Chevrolet ..... Biscayne, Biscayne Fleetmaster, Bel Air, Impala	V	IH	8-4 1/16 x3 1/4	348.0	9.50	250-4400	355-2800	Hyd	Hyd	D	Cart	3779180	1	FB	DR	1110948	8B-.....	3.36	3.08	CR,Ex,Car,Dis,IT
Biscayne, Biscayne Fleetmaster, BelAir, Impala	V	IH	8-4 1/16 x3 1/4	348.0	9.50	280-4800	355-3200	Hyd	Hyd	D	Roc	7013015[4]	3	D	DR	1110948	8B-.....	3.36	3.08	Car
Biscayne, Biscayne Fleetmaster, BelAir, Impala	V	IH	8-4 1/16 x3 1/4	348.0	9.50	305-5200	355-3400	Hyd	Hyd	D	Cart	3772600	1	FB	DR	1110948	8B-.....	3.36	3.55	Car,AR
Biscayne, Biscayne Fleetmaster, BelAir, Impala	V	IH	8-4 1/16 x3 1/4	348.0	11.25	340-5800	362-3600	.008	.018	D	Cart	3772600	1	FB	DR	1110919	12B-.....	3.70	N	CR,VL,Dis,IT,AR
Biscayne, Biscayne Fleetmaster, BelAir, Impala	V	IH	8-4 1/16 x3 1/4	348.0	11.25	350-6000	364-3600	.008	.018	D	Roc	7013973[5]	3	D	DR	1110919	12B-.....	3.70	N	Car
Tempest	V	IH	8-3 1/2 x2 1/2	215.0	8.80	155-4600	220-2400	Hyd	Hyd	SC	Roc	7019863	1	D	DR	1110977	5B-600	3.55	3.55	CA,CR,Car,Dis,IT

ABBREVIATIONS

[2]—Front only; rear, AFB-2791S.
[4]—Front only; center, 7013020; rear, 7013017.
[5]—Front only; center, 7013974; rear, 7013975.

AL—Autolite.
AR—Axle ratio.
B—Before top center.
CA—Cylinder arrangement.
Car—Carburetor.
Cart—Carter.
Chr—Chrysler.
CR—Compression ratio.
D—Dual.
Dis—Distributor. **DR**—Delco-Remy.
Ex—Exhaust system.
FB—Four barrel.
F-H—Ford or Holley.
Fo—Ford.
H—Hot.
Hol—Holley.
Hyd—Hydraulic valve lifters, automatic take-up.
IH—In head.
IL—In line.
IT—Ignition timing.
N—None.
Roc—Rochester.
S—Single.
SC—Single with crossover.
V—"V" type engine.
VA—Valve arrangement.
VC—Valve tappet clearance.
VL—Valve lifters.

PISTON RINGS, PISTON PINS, AND CONNECTING RODS

PASSENGER CAR MAKE AND MODEL	PISTON RINGS											PISTON PIN						CONNECTING RODS						
	Function			Compression				Oil							Type			Clearance					Bearing		
	No. 1	No. 2	No. 3	Material	Coating	Width	Gap	Material	Coating	Width	Gap	Material	Length	Diameter	Locked in—	Bushing Location	Bushing Material	In Piston	In Rod	Material	Weight (oz.)	Length (center to center)	Material	Overall Length	Clearance	End Play
AMERICAN MOTORS CORP.																										
Rambler — American, Classic-6	C	C	O	Al	Ch[1]	.0933[2]	.015	St	Ch	.0245	.035	1016	2.7500	.8597	R	N	.....	Ppf	PF	1145	23.00	6.6250	Mbs	.9600	.0013	.010
Classic-8	C	C	O	Al	Ch[3]	.0778	.015	St	Ch	.0245	.035	1016	3.1870	.9307	R	N	.....	Ppf	PF	1145	27.80	6.3750	Mbs[4]	.8670	.0018	.008
Ambassador	C	C	O	Al	Ch[3]	.0778	.015	St	Ch	.0245	.035	1016	3.1870	.9307	R	N	.....	Ppf	PF	1145	27.80	6.3750	Cla	.8670	.0018	.008
CHECKER MOTORS CORP.																										
Checker — Superba, Marathon	C	C	C[5]	.....	Ch[3]	.0930[6]	.015	Al	.....	.2500	.014	1019	2.8125	.8590	F	R	Br	.0002	.0004	1041	32.24	7.0000	Dsb	1.1250	.0027	.008
CHRYSLER CORP.																										
Chrysler — Newport, Windsor	C	C	O	Cl	Tp	.0780	.019	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0011	DFS	28.60	6.3600	Bsb	.9270	.0010	.013
New Yorker	C	C	O	Cl	Tp	.0780	.019	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0011	DFS	29.80	6.7700	Bsb	.9270	.0010	.013
300-G	C	C	O	Cl	Tp	.0780	.019	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0010	DFS	29.80	6.7700	Bsb	.9270	.0015	.013
De Soto	C	C	O	Cl	Tp	.0780	.019	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0011	DFS	28.60	6.3600	Bsb	.9270	.0010	.013
Dodge	C	C	O	Cl	Tp	.0780	.019	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0011	DFS	28.60	6.3600	Bsb	.9270	.0010	.013
Dodge Dart — Seneca, Pioneer, Phoenix-6	C	C	O	.....	Tp[1]	.0780	.015	.....	Ch	.1860	.015	HMS	2.9650	.9008	R	N	.....	.0008	.0011	DFS	27.34	6.6990	Bsb	.9850	.0010	.009
Seneca, Pioneer, Phoenix-8	C	C	O	Cl	Tp	.0780	.015	Cl	.....	.1860	.015	HMS	2.9950	.9842	F	R	Brs	.0003	.0004	HMFS	25.60	6.1250	Bmg	.8430	.0010	.010
Dodge Lancer — 170, 770	C	C	O	Cl	Tp	.0780	.015	Cl	.....	.1860	.015	HMS	2.9650	.9008	R	N	.....	.0008	.0011	DFS	25.68	5.7070	Bsb	.9850	.0010	.009
Imperial — Custom, Crown, Le Baron	C	C	O	Cl	Tp	.0780	.015	Cl	.....	.1860	.019	HMS	3.5650	1.0940	R	N	.....	.0008	.0011	DFS	29.80	6.7700	Bsb	.9270	.0010	.013
Plymouth — Savoy, Belvedere, Fury-6	C	C	O	.....	Tp[1]	.0780	.015	.....	Ch	.1860	.015	HMS	2.9650	.9008	R	N	.....	.0008	.0011	DFS	27.30	6.6990	Bsb	.9850	.0010	.009
Savoy, Belvedere, Fury-8	C	C	O	.....	Tp	.0780	.015	Cl	.....	.1860	.015	HMS	2.9950	.9842	F	R	Brs	.0003	.0004	HMFS	25.60	6.1250	Bmg	.8430	.0010	.010
Valiant — V-100, V-200	C	C	O	Cl	Tp	.0780	.015	Cl	.....	.1860	.015	HMS	2.9650	.9008	R	N	.....	.0008	.0011	DFS	25.68	5.7070	Bsb	.9850	.0010	.009
FORD MOTOR CO.																										
Comet	C	C	O	ACI	Ch[7]	.0780	.015	St	Ch	.1875	.033	AS	3.0200	.9120	R	P	.....	.0002	.....	SF	18.65	4.8550	.....	.8050	.0016	.007
Falcon	C	C	O	ACI	Ch[7]	.0780	.015	St	Ch	.1875	.035	AS	3.0200	.9120	R	P	.....	.0002	.....	SF	18.65	4.8550	.....	.8050	.0016	.007
Ford — Fairlane, Fairlane 500, Galaxie-6	C	C	O	Cl	Ch[7]	.0933	.015	St	Ch	.1875	.035	5015	3.0200	.9122	F	R	Br	.0002	.0002	SF	27.04	6.2600	Bsb	1.0934	.0011	.006
Fairlane, Fairlane 500, Galaxie-8	C	C	O	Cl	Ch[7]	.0778	.015	St	Ch	.1875	.035	5015	3.0200	.9122	F	R	Br	.0002	.0002	SF	24.21	6.3220	Cla	.7410	.0015	.011
Lincoln Continental	C	C	O	Cl	Ch[7]	.0778[8]	.020	St	Ch	.1875	.035	5015	3.4900	.9751	R	N	.....	.0003	N	1041	27.80	6.6000	Cla	.8610	.0011	.010
Mercury — Meteor 600, 800	C	C	O	ACI	Ch[9]	.0933	.015	St	Ch	.1875	.035	5015	3.0200	.9122	F	R	Br	.0002	.0002	SF	29.63	6.2550	Bsb	1.0340	.0011	.006
Meteor 600, 800; Monterey	C	C	O	ACI	Ch[9]	.0778	.015	St	Ch	.1875	.035	5015	3.0200	.9122	F	R	Br	.0002	.0002	SF	24.05	6.3220	Cla	.7410	.0015	.011
Thunderbird	C	C	O	ACI	Ch[7]	.0778[8]	.020	St	Ch	.1875	.035	5015	3.1600	.9752	F	R	Br	.0002	.0002	SF	25.47	6.4880	Cla	.7405	.0019	.011
GENERAL MOTORS CORP.																										
Buick — Special	C	C	O	Cl	Ch[1]	.0775	.015	St	Ch	.1840	.025	1118	2.8700	.8749	R	N	.....	.0001	.0010	1141	17.55	5.6600	Dsb	.7370	.0012	.010
Le Sabre	C	C	O	Cl	Lub	.0775	.020	St	N	.1840	.025	1118	3.5200	.9996	R	N	.....	.0001	.0010	1141	23.20	6.1000	Als	.8200	.0013	.009
Invicta, Electra, Electra 225	C	C	O	Cl	Lub	.0775	.020	St	N	.1840	.025	1118	3.5200	.9996	R	N	.....	.0001	.0010	1141	24.38	6.2200	Als	.8200	.0013	.009
Cadillac — 60, 62, 63, 75	C	C	O	Cl	Ch[1]	.0781	.015	St	Ch	.1875	.015	1045	3.0930	1.0000	R	N	.....	.0008	PF	1041	22.56	6.5000	.....	.8175	.0013	.011
Chevrolet — Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	C	C	O	ACI	WR	.0933	.012	St	Ch	.1880	.035	CS	3.1850	.8863	R	N	.....	.0002	N	SF	28.03	6.8125	Bsb	1.0060	.0017	.008
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	C	C	O	ACI	Ch[10]	.0778	.015	St	Ch	.1880	.035	CS	3.0000	.9272	R	N	.....	.0002	N	DFS	19.02	5.7000	Bsb	.8170	.0017	.009
Corvair — 500, 700, 900	C	C	O	ACI	WR	.0775	.015	ACI	N	.1863	.015	AS	2.6400	.8001	R	N	.....	.0002	N	DFS	13.73	4.7200	Bsb	.6490	.0017	.008
Corvette	C	C	O	ACI	Ch	.0778[11]	.015	St	Ch	.1940	.035	CS	3.0000	.9272	R	N	.....	.0002	N	DFS	19.02	5.7000	Bsb	.8170	.0017	.011
Oldsmobile — F-85	C	C	O	Cl	Ch[3]	.0788[12]	.015	St	Ch	.2252	.035	1118	2.8700	.8749	R	N	.....	.0004	.0010	1045	17.89	5.6600	Dsb	.7370	.0012	.009
88, Super 88, 98	C	C	O	Cl	Ch[1]	.0778[2]	.018	St	Ch	.2280	.035	1016	3.1260	.9805	F	R	Br	.0004	.0004	1139	34.55	6.9980	Als	.8260	.0015	.007
Pontiac — Catalina, Ventura, Star Chief, Bonneville	C	C	O	Cl	Ch[1]	.0780	.021[13]	St	Ch	.1840	.025	1117	3.2500	.9802	R	N	.....	.0004	PF	1139	29.34	6.6250	Dsb	.8800	.0015	.009
Tempest	C	C	O	Cl	Ch[1]	.0780	.021[13]	St	Ch	.1840	.025	1117	3.2500	.9802	R	N	.....	.0004	PF	1139	29.34	6.6250	Dsb	.8300	.0015	.007
STUDEBAKER-PACKARD CORP.																										
Studebaker — Lark-6	C	C	O	Cl	Ch[3]	.0930[15]	.012	Cl	Bl	.1560	.012	6620	2.6250	.7500	R	N	.....	.0047	N	1041	19.04	6.3750	Bsb	.9050	.0013	.007
Lark-8	C	C	O	Cl	Ch[14]	.0780	.012	Cl	Gr	.1870	.012	5120	3.0620	.8750	R	N	.....	.0047	N	1141	23.71	6.6250	Bsb	.8430	.0015	.011
Hawk	C	C	O	Cl	Gr	.0780	.012	Cl	Gr	.1870	.012	5120	3.0625	.8750	R	N	.....	.0002	N	1141	23.73	6.6250	Bsb	.8430	.0013	.011

ABBREVIATIONS

1—Upper only; lower, Parco-Lubrite.
2—Upper only; lower, .0930.
3—Upper only; lower, ferrox.
4—Aluminum block engines use a sintered copper-lead alloy, steel backed bearing.
5—No. 4, oil; No. 5, compression.
6—Nos. 2 and 3, .1250; No. 5, .156.
7—Upper only; lower, phosphate.
8—Upper only; lower, .0935.
9—Upper only; lower, oxide.
10—Upper only; lower, wear resistant.
11—Upper only; lower, .0775.
12—Upper only; lower, .0785.
13—Upper only; lower, .019.
14—Upper only; lower, granoseal.
15—Upper only; lower, .1250.
ACI—Alloy cast iron.
Al—Alloy iron.
Als—Aluminum, steel backed.
AS—Alloy steel.
Bl—Blued.
Bmg—Bi-metal grid.
Br—Bronze.
Brs—Bronze, steel backed.
Bsb—Lead base babbitt, steel backed.
C—Compression.
Ch—Chrome plate.
Cl—Cast iron.
Cla—Copper-lead alloy, steel backed.
CS—Chromium steel.
DFS—Drop forged steel.
Dsb—Durex, steel backed.
F—Floating.
Gr—Granoseal.
HMS—High manganese steel.
HMFS—High manganese forging steel.
Lub—Lubrite.
Mbs—Micro-babbitt, steel backed.
N—None.
O—Oil.
P—Piston.
Pf—Press fit.
Ppf—Palm press fit.
R—Connecting rod.
SF—Steel forging.
St—Steel.
Tp—Tin plated.
WR—Wear resistant coating.

CRANKSHAFTS, CAMSHAFTS

PASSENGER CAR MAKE AND MODEL	CRANKSHAFT												CAMSHAFT							
					Main Bearing										Bearings			Timing Chain		
							Journal Diameter and Bearing Effective Length													
	Material	Vibration Dampener Type	End Thrust Taken Up by Bearing	Crankshaft End Play	Material	Clearance	No. 1	No. 2	No. 3	No. 4	No. 5	Connecting Rod Crankpin Journal Diameter	Location	Material	Material	Number	Type of Drive	Number of Links	Width	Pitch
AMERICAN MOTORS CORP.																				
Rambler — American, Classic-6	DFS	RF	1	.0055	Mbs[1]	.0013	2.4795x1.1250	2.4795x1.1250	2.4795x1.1250	2.4795x1.1531	None	2.0952	RS	CIA	Mbs	4	Ch	60	1.0000	.375
Classic-8, Ambassador	DFS	RF	1	.0050	Mbs	.0016	2.4992x .9560	2.4992x .9500	2.4992x .9500	2.4992x .9500	2.4992x .9500	2.2487	Cen	CIA	Mbs	5	Ch	62	.8750	.375
CHECKER MOTORS CORP.																				
Checker — Superba, Marathon	1046	BR	1	.0050	Bsb	.0034	2.3750x1.0620	2.3750x1.3120	2.3750x1.3120	2.3750x1.4840	None	2.0620	RS	1019	Bsb	4	Ch	46	.8750	.500
CHRYSLER CORP.																				
Chrysler — Newport, Windsor	DFS	RD	3	.0045	Lbs[2]	.0010	2.6300x .9400	2.6300x .9400	2.6300x1.2200	2.6300x .9400	2.6300x .9400	2.3750	Cen	HCI	Lbs	5	Ch	50	.8800	.500
New Yorker, 300-G	DFS	RD	3	.0045	Lbs[2]	.0010	2.7500x .9400	2.7500x .9400	2.7500x1.2200	2.7500x .9400	2.7500x .9400	2.3750	Cen	HCI	Lbs	5	Ch	50	.8800	.500
De Soto	DFS	RD	3	.0045	Lbs[2]	.0010	2.6300x .9400	2.6300x .9400	2.6300x1.2200	2.6300x .9400	2.6300x .9400	2.3750	Cen	HCI	Lbs	5	Ch	50	.8800	.500
Dodge — Polara	DFS	RD	3	.0045	Lbs[2]	.0010	2.6300x .9400	2.6300x .9400	2.6300x1.2200	2.6300x .9400	2.6300x .9400	2.3750	Cen	HCI	Lbs	5	Ch	50	.8800	.500
Dodge Dart — Seneca, Pioneer, Phoenix-6	DFS	RD	3	.0045	Lbs[2]	.0010	2.7500x1.0340	2.7500x1.0340	2.7500x1.2540	2.7500x1.0340	None	2.1870	RS	HCI	Lbs	4	Ch	50	.8800	.500
Seneca, Pioneer, Phoenix-8	DFS	N	3	.0045	Lbs[2]	.0010	2.5000x .8700	2.5000x .8700	2.5000x1.1500	2.5000x .8700	2.5000x1.5600	2.1250	Cen	HCI	Lbs	5	Ch	68	1.0200	.380
Dodge Lancer — 170, 770	DFS	RD	3	.0045	Lbs[2]	.0010	2.7500x1.0340	2.7500x1.0340	2.7500x1.2540	2.7500x1.0340	None	2.1870	RS	HCI	Lbs	4	Ch	50	.8800	.500
Imperial — Custom, Crown, Le Baron	DFS	RD	3	.0045	Lbs[2]	.0010	2.7500x .9400	2.7500x .9400	2.7500x1.2200	2.7500x .9400	2.7500x .9400	2.3750	Cen	HCI	Lbs	5	Ch	50	.8800	.500
Plymouth — Savoy, Belvedere, Fury-6	DFS	RD	3	.0045	Lbs[2]	.0010	2.7500x1.0340	2.7500x1.0340	2.7500x1.2540	2.7500x1.0340	None	2.1870	RS	HCI	Lbs	4	Ch	50	.8800	.500
Savoy, Belvedere, Fury-8	DFS	RD	3	.0045	Lbs[2]	.0010	2.5000x .8700	2.5000x .8700	2.5000x1.1500	2.5000x .8700	2.5000x1.5600	2.1250	Cen	HCI	Lbs	5	Ch	68	1.0200	.380
Valiant — V-100, V-200	DFS	RD	3	.0025	Lbs[2]	.0010	2.7500x1.0340	2.7500x1.0340	2.7500x1.2540	2.7500x1.0340	None	2.1870	RS	HCI	Lbs	4	Ch	50	.8800	.500
FORD MOTOR CO.																				
Comet	CIA	N	3	.0060	Mbs	.0011	2.2485x1.0150	2.2485x1.0150	2.2485x1.2700	2.2485x1.0150	None	2.1235	RS	SAI	Bsb	4	Ch	50	.8750	.375
Falcon	CIA	N	3	.0060	Mbs	.0011	2.2485x1.0150	2.2485x1.0150	2.2485x1.2700	2.2485x1.0150	None	2.1235	RS	SAI	Bsb	4	Ch	50	.8750	.375
Ford — Fairlane, Fairlane 500, Galaxie-6	CIA	RFI	3	.0060	Bsb[3]	.0015	2.4984x1.1000	2.4984x1.1000	2.4984x1.3540	2.4984x1.1000	None	2.2984	RS	SAI	Bsb	4	Ch	56	1.0000	.375
Fairlane, Fairlane 500, Galaxie-8	CIA	RFI	3	.0060	Bsb[3]	.0018	2.4984x .9070	2.4984x .9070	2.4984x1.1190	2.4984x .9070	2.4984x .9070	2.1884	Cen	SAI	Bsb	5	Ch	48	.8600	.500
Lincoln Continental	MAI	RFI	3	.0060	Clt	.0013	2.8999x .9550	2.8999x .9550	2.8999x1.1190	2.8999x .9550	2.8999x .9550	2.5997	Cen	MAI	Lbs	5	Ch	52	.8640	.500
Mercury — Meteor 600, 800-6	CIA	RFI	3	.0060	Bsb[3]	.0015	2.4984x1.1000	2.4984x1.1000	2.4984x1.3540	2.4984x1.3250	None	2.2984	RS	SAI	Bsb	4	Ch	56	1.0000	.375
Meteor 600, 800; Monterey-8	CIA	RFI	3	.0060	Bsb[3]	.0018	2.4984x .9070	2.4984x .9070	2.4984x1.1210	2.4984x .9070	2.2984x .9070	2.1884	Cen	SAI	Bsb	5	Ch	56	1.0000	.375
Thunderbird	CIA	RFI	3	.0060	Cls	.0021	2.7488x .9070	2.7488x .9070	2.7488x1.1190	2.7488x .9070	2.7488x .9070	2.4384	Cen	SAI	Bsb	5	Ch	48	.8800	.500
GENERAL MOTORS CORP.																				
Buick — Special	PMI	RA	3	.0060	Dsb	.0013	2.2992x .8020	2.2992x .8020	2.2992x .8210	2.2992x .8020	2.2992x .8020	2.0000	Cen	CIA	Bsb	5	Ch	54	.8750	.375
Le Sabre	1145	RA	5	.0060	Msb[4]	.0013	2.4985x .9400	2.4985x .9400	2.4985x .9400	2.4985x .9400	2.4985x1.1990	2.2495	Cen	CIA	Bsb	5	Ch	52	.8640	.500
Invicta, Electra, Electra 225	1145	RA	3	.0060	Msb[4]	.0013	2.4985x .9400	2.4985x .9400	2.4985x .8910	2.4985x .9400	2.4985x1.2000	2.2495	Cen	CIA	Bsb	5	Ch	52	.8640	.500
Cadillac — 60, 62, 63, 75	1145	RA	5	.0040	Msb[4]	.0017	2.6250x .9070	2.6250x .9070	2.6250x .9070	2.6255x .9070	2.6250x1.6220	2.2500	Cen	CI	Bsb	5	Ch	46	.6875	.500
Chevrolet — Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	SF	RFI	3	.0065	Bsb	.0016[5]	2.6840x1.0630	2.7150x .9070	2.7460x .9790	2.7770x1.1890	None	2.3115	RS	CIA	Bsb	4	G	N	.....	.....
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	SF	N	5	.0040	Bsb	.0021	2.2983x .7620	2.2983x .7620	2.2983x .7620	2.2983x .7620	2.2983x1.1690	1.9995	Cen	CIA	Bsb	5	Ch	46	.8750	.500
Corvair — 500, 700, 900	DFS	N	1	.0040	Bsb	.0025	2.0983x .7850	2.0983x .7520	2.0988x .7520	2.0988x .7520	None	1.7995	Cen	CIA	CM	4	G	N	.....	.....
Corvette	SF	RM	5	.0040	Bsb	.0021	2.2983x .7620	2.2983x .7620	2.2983x .7620	2.2983x .7620	2.2983x1.1690	1.9995	Cen	CIA	Bsb	5	Ch	46	.8750	.500
Oldsmobile — F-85	PMI	RA	3	.0060	Dbs	.0013	2.2986x .8020	2.2986x .8020	2.2986x1.0570	2.2986x .8020	2.2986x .8020	2.0000	Cen	CIA	Bsb	5	Ch	54	.8750	.375
88, Super 88, 98	1145	RA	5	.0060	Msb[4]	.0013[6]	3.0000x1.0680	3.0000x .8180	3.0000x .8180	3.0000x .8180	3.0000x1.6900	2.5000	Cen	CIA	Bsb	5	Ch	48	.8440	.500
Pontiac — Catalina, Ventura, Star Chief, Bonneville	PMI	RFI	4	.0060	Dsb[7]	.0018[9]	3.0000x .9400	3.0000x .9400	3.0000x .9400	3.0000x1.1300	3.0000x1.5900	2.2500	Cen	CIA	Lbs	5	Ch	60	.8800[8]	.375
Tempest	PMI	RFI	4	.0060	Dsb[7]	.0018[9]	3.0000x .9400	3.0000x .9400	3.0000x .9400	3.0000x1.1300	3.0000x1.5900	2.2500	LS	CIA	Lbs	5	Ch	60	.8800[8]	.375
STUDEBAKER-PACKARD CORP.																				
Studebaker — Lark-6	1046	RMD	1	.0045	Bsb	.0014[10]	3.0620x1.3450	3.0620x1.1250	3.0620x1.1250	3.0620x1.5310	None	1.8120	RS	CIA	Bsb	4	G	N	.....	.....
Lark, Hawk-8	1046	RMD	1	.0045	Bsb	.0017	2.5000x1.3090	2.5000x .9060	2.5000x .9060	2.5000x .9060	2.5000x1.5460	2.0000	Cen	CIA	Bsb	5	G	N	.....	.....

ABBREVIATIONS

1—Aluminum block engines use sintered copper-lead alloy, steel backed bearings.
2—No. 3 bearing is tin base babbitt, steel backed.
3—No. 4 bearing is copper-lead alloy, steel backed.
4—No. 5 bearing is Durex, steel backed.
5—Front two bearings only; rear two, .0018.
6—No. 1 and 2 only; No. 3 and 4, .0016; No. 5, .0027.
7—Moraine, steel backed bearing used in lower half of No. 4.
8—Morse chain only; Link Belt chain, 1.0000.
9—No. 1 bearing, .0015.
10—No. 1 bearing, .0011.
BR—Bonded rubber.
Bsb—Babbitt, steel backed.
Cen—Center, between cylinder banks.
Ch—Chain.
CI—Cast iron.
CIA—Cast iron alloy.
Cls—Copper-lead alloy, steel backed.
Clt—Copper-lead alloy, steel backed, tin plated.
CM—Crankcase machined for bearing surfaces, no inserts.
Dbs—Durex with babbitt overlay, steel backed.
DFS—Drop forged steel.
Dsb—Durex, steel backed.
G—Gear.
HCI—Hardenable cast iron.
Lbs—Lead base babbitt, steel backed.
LS—Left side of engine block.
MAI—Moulded alloy iron.
Mbs—Micro-babbitt, steel backed.
Msb—Moraine, steel backed.
N—None.
PMI—Pearlitic malleable iron.
RA—Rubber absorption.
RD—Non adhesion rubber dynamic.
RF—Rubber friction.
RFI—Rubber floated.
RM—Rubber mounted.
RMD—Rubber mounted disc.
RS—Right side of engine block.
SAI—Special alloy iron.
SF—Steel forging.

VALVES, INTAKE AND EXHAUST

PASSENGER CAR MAKE AND MODEL	Hydraulic Lifters	Special Provision for Valve Rotation (Intake or Exhaust)	Rocker Ratio—to-1	INTAKE										EXHAUST									
				Material	Overall Length	Actual Overall Head Diameter	Seat Angle (Deg.)	Stem		Lift (In.)	Springs				Material	Overall Length	Actual Overall Head Diameter	Seat Angle (Deg.)	Stem		Lift (In.)	Springs			
								Diameter (In.)	Guide Clearance		Pressure (lb.)		Length (in.)						Diameter (In.)	Guide Clearance		Pressure (lb.)		Length (in.)	
											Valve Closed	Valve Open	Valve Closed	Valve Open								Valve Closed	Valve Open	Valve Closed	Valve Open
AMERICAN MOTORS CORP.																							
Rambler American (Deluxe and Super)	NA	N	N	1041	4.781	1.469	45	.3410	.0026	.324	39.[1]	78.5	1.750	1.440	Sil	4.784	1.281	45	.3410	.0026	.322	39.0	78.5	1.750	1.440
American (Custom)	NA	N	1.463	1041	4.791	1.594	45	.3415	.0025	.366	67.5	120.0	1.813	1.438	21-4N	4.791	1.343	45	.3410	.0030	.361	67.5	120.0	1.813	1.438
Classic-6 (Cast Iron Block)	NA	N	1.460	1041	4.791	1.594	45	.3415	.0025	.366	67.5	120.0	1.813	1.438	21-4N	4.791	1.343	45	.3410	.0030	.361	67.5	120.0	1.813	1.438
Classic-6 (Aluminum Block)	Std	N	1.600	1041	4.791	1.594	45	.3415	.0025	.388	67.5	120.0	1.813	1.438	21-4N	4.808	1.250	45	.3410	.0030	.388	67.5	120.0	1.813	1.438
Classic-8	NA	Bo	1.500	Sil	4.859	1.787	30	.3720	.0020	.375	88.0	155.0	1.813	1.438	21-4N	4.859	1.406	45	.3720	.0020	.375	88.0	155.0	1.813	1.438
Ambassador	Std	Bo	1.500	Sil	4.859	1.787	30	.3720	.0020	.375	88.0	155.0	1.813	1.438	21-4N	4.859	1.406	45	.3720	.0020	.375	88.0	155.0	1.813	1.438
CHECKER MOTORS CORP.																							
Checker Superba, Marathon	NA	N	N	3140	5.187	1.515	30	.3437	.0021	.284	50.0	106.5	1.656	1.375	.....	5.172	1.328	44	.3440	.0041	.284	50.0	106.5	1.656	1.375
CHRYSLER CORP.																							
Chrysler Newport, Windsor, New Yorker	Std	E	1.500	AS	4.870	2.080	45	.3730	.0020	.390	100.0	195.0	1.860	1.470	21-4N	4.890	1.600	45	.3720	.0030	.390	100.0	195.0	1.860	1.470
300-G	Std	E	1.500	AS	4.868	2.080	45	.3725	.0030	.430	105.0	205.0	1.860	1.430	21-4N	4.888	1.600	45	.3720	.0030	.430	105.0	205.0	1.860	1.430
De Soto	Std	E	1.500	AS	4.870	2.080	45	.3730	.0020	.390	100.0	195.0	1.860	1.470	21-4N	4.890	1.600	45	.3720	.0030	.390	100.0	195.0	1.860	1.470
Dodge	Std	E	1.500	AS	4.870	2.080	45	.3730	.0020	.390	100.0	195.0	1.860	1.470	21-4N	4.890	1.600	45	.3720	.0030	.390	100.0	195.0	1.860	1.470
Polara	Std	E	1.500	AS	4.870	2.080	45	.3730	.0020	.390	100.0	195.0	1.860	1.470	21-4N	4.890	1.600	45	.3720	.0030	.390	100.0	195.0	1.860	1.470
Dodge Dart Seneca, Pioneer, Phoenix-6	NA	E	1.500	1041	4.774	1.620	45	.3730	.0020	.371	83.0	177.0	1.690	1.310	21-4N	4.797	1.360	46	.3720	.0030	.364	83.0	177.0	1.690	1.310
Seneca, Pioneer, Phoenix-8	NA	E	1.500	1041	4.600	1.840	45	.3730	.0020	.370	83.0	177.0	1.690	1.310	21-4N	4.797	1.360	46	.3720	.0030	.364	83.0	177.0	1.690	1.310
Dodge Lancer 170, 770	NA	E	1.500	AS	4.774	1.620	46	.3720	.0020	.371	83.0	177.0	1.690	1.310	21-4N	4.540	1.560	45	.3720	.0030	.368	83.0	177.0	1.690	1.310
Imperial Custom, Crown, Le Baron	Std	E	1.500	AS	4.870	2.080	45	.3730	.0020	.390	100.0	195.0	1.860	1.470	21-4N	4.797	1.360	46	.3720	.0030	.364	83.0	177.0	1.690	1.310
Plymouth Savoy, Belvedere, Fury-6	NA	E	1.500	1041	4.774	1.620	46	.3720	.0020	.375	83.0	177.0	1.690	1.310	21-4N	4.890	1.600	45	.3720	.0030	.390	100.0	195.0	1.860	1.470
Savoy, Belvedere, Fury-8	NA	E	1.500	1041	4.600	1.840	45	.3720	.0020	.370	83.0	177.0	1.690	1.310	21-4N	4.797	1.360	46	.3720	.0030	.368	83.0	177.0	1.690	1.310
Valiant V-100, V-200	NA	E	1.500	1041	4.774	1.620	46	.3720	.0020	.371	83.0	177.0	1.690	1.310	21-4N	4.540	1.560	45	.3720	.0030	.368	83.0	177.0	1.690	1.310
															21-4N	4.797	1.360	46	.3720	.0030	.364	83.0	177.0	1.690	1.310
FORD MOTOR CO.																							
Comet	NA	Bo	1.500	1047	4.260	1.467	45	.3100	.0017	.344	52.0	117.0	1.585	1.222	Aus	4.260	1.266	45	.3090	.0027	.344	52.0	117.0	1.585	1.222
Falcon	NA	Bo	1.500	1047	4.260	1.467	45	.3100	.0017	.344	52.0	117.0	1.585	1.222	Aus	4.260	1.266	45	.3090	.0027	.344	52.0	117.0	1.585	1.222
Ford Fairlane, Fairlane 500, Galaxie-8	NA	Bo	1.430	SA	5.110	1.780	45	.3420	.0017	.369	75.0	169.0	1.780	1.390	Aus	5.090	1.513	45	.3402	.0035	.369	75.0	169.0	1.780	1.390
Fairlane, Fairlane 500, Galaxie-8	NA	Bo	1.430	SA	5.090	1.647	45	.3420	.0017	.360	75.0	169.0	1.780	1.390	Aus	5.090	1.513	45	.3402	.0035	.360	75.0	169.0	1.780	1.390
Lincoln Continental	Std	Bo	1.780	Sil	5.363	1.963	45	.3715	.0015	.408	70.0	190.0	1.640	1.230	Aus	5.383	1.653	45	.3705	.0025	.408	70.0	190.0	1.640	1.230
Mercury Meteor 600, 800-6	NA	Bo	1.430	SA	5.110	1.780	45	.3420	.0017	.369	75.0	169.0	1.780	1.390	Aus	5.090	1.513	45	.3402	.0035	.369	75.0	169.0	1.780	1.390
Meteor 600, 800; Monterey-8	NA	Bo	1.430	SA	5.090	1.647	45	.3420	.0017	.360	75.0	169.0	1.780	1.390	Aus	5.090	1.513	45	.3402	.0035	.360	75.0	169.0	1.780	1.390
Thunderbird	Std	Bo	1.760	SA	5.446	2.030	45	.3715	.0017	.408	79.5	199.0	1.820	1.420	Aus	5.426	1.559	45	.3697	.0035	.408	79.0	199.0	1.820	1.420
GENERAL MOTORS CORP.																							
Buick Special	Std	N	1.600	NCA	4.605	1.500	45	.3410	.0018	.383	64.0	168.0	1.640	1.260	Sil	4.605	1.313	45	.3405	.0023	.383	64.0	168.0	1.640	1.260
Le Sabre	Std	N	1.600	NCA	4.785	1.875	45	.3725	.0025	.443	42.0[1]	96.0[1]	1.600[1]	1.160[1]	Sil	4.785	1.500	45	.3720	.0030	.439	42.0[1]	96.0[1]	1.600[1]	1.160[1]
Invicta, Electra, Electra 225	Std	N	1.600	NCA	4.785	1.875	45	.3725	.0025	.439	42.0[1]	96.0[1]	1.600[1]	1.160[1]	Sil	4.785	1.500	45	.3720	.0030	.441	42.0[1]	96.0[1]	1.600[1]	1.160[1]
Cadillac 60, 62, 63, 75	Std	N	1.650	1041	4.794	1.875	44	.3420	.0015	.451	62.5	160.0	1.946	1.496	81940	4.815	1.500	44	.3418	.0018	.451	62.5	160.0	1.946	1.496
Chevrolet Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	Std	N	1.477	CS	6.386	1.875	31	.3414	.0019	.328	65.0	163.0	1.858	1.528	HAS	4.923	1.500	46	.3414	.0019	.328	65.0	163.0	1.858	1.528
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	Std	N	1.500	CS	4.912	1.720	46	.3419	.0019	.334	80.0	160.0	1.696	1.366	HAS	4.923	1.500	46	.3414	.0024	.334	80.0	160.0	1.696	1.366
Corvair 500, 700, 900	Std	N	1.500	Ast	4.499	1.340	45	.3419	.0019	.314	61.0	145.0	1.508	1.148	HAS	4.504	1.240	45	.3409	.0024	.344	61.0	145.0	1.508	1.148
Corvette	Std	N	1.500	CS	4.912	1.720	46	.3419	.0019	.399	74.0	164.0	1.696	1.306	HAS	4.923	1.500	46	.3414	.0024	.399	74.0	164.0	1.696	1.306
Oldsmobile F-85	Std	N	1.600	3145[2]	4.868	1.522	45	.3430	.0018	.384	75.0	167.0	1.750	1.350	82152	4.856	1.353	45	.3420	.0018	.384	75.0	167.0	1.750	1.350
88, Super 88, 98	Std	N	1.800	3145[2]	4.999	1.875	45	.3430	.0018	.435	90.0	182.0	1.837	1.437	82152	4.999	1.562	45	.3943	.0023	.437	90.0	182.0	1.837	1.437
Pontiac Catalina, Ventura, Star Chief, Bonneville	Std	N	1.500	MMS	4.850	1.880	30	.3400	.0030	.330	80.0	171.0	1.530	1.200	XCR	4.840	1.600	45	.3400	.0035	.330	80.0	171.0	1.530	1.200
Tempest	Std	N	1.500	MMS	4.850	1.880	30	.3400	.0030	.330	80.0	171.0	1.530	1.200	XCR	4.840	1.600	45	.3400	.0035	.330	80.0	171.0	1.530	1.200
STUDEBAKER-PACKARD CORP.																							
Studebaker Lark-6	NA	N	1.500	8645	5.250	1.593	45	.3430	.0025	.375	50.0	110.0	2.031	1.671	2112N	5.250	1.406	45	.3430	.0025	.375	50.0	110.0	2.031	1.671
Lark, Hawk-8	NA	N	1.500	8645	5.156	1.656	45	.3430	.0025	.375	50.0	110.0	2.031	1.671	2112N	5.156	1.531	45	.3430	.0025	.375	50.0	110.0	2.031	1.671

ABBREVIATIONS

1—Outer spring only; inner spring, 25.5 at 1.690 with valve closed and 76.0 at 1.250 with valve open

2—Thompson valve only; Eaton valve, 8645.

AS—Aluminized steel.
Ast—Alloy steel.
Aus—Cast austenitic steel.
Bo—Both intake and exhaust.
CS—Carbon steel.
E—Exhaust only.
HAS—High alloy steel.
MMS—Manganese-Moly steel.
N—None.
NA—Not available.
NCA—Nickel-Chrome alloy steel.
Sil—Silichrome steel.
Std—Standard.

FUEL AND COOLING SYSTEMS

PASSENGER CAR MAKE AND MODEL	FUEL SYSTEM													COOLING SYSTEM															
				Fuel Pump		Carburetor						Air Cleaner Type			Thermostat				Capacity				Radiator Hose					
	Induction Type	Fuel Tank Capacity (Gal.)	Fuel Filter Type	Pressure Range (lb.)	Vacuum Booster	Make	Model Number	Number Used	Type	Barrel Size (In.)	Choke—Type	Standard	Optional	Radiator Cap Relief Valve Pressure (lb.)	Type	Starts to Open at (Deg.)	By-Pass Recirculation—Type	Radiator Core Type	With Heater (qt.)	Without Heater (qt.)	Full Length Water Jackets	Water All Around Cylinder	Lower		Upper		By-Pass	
																							Number and Type	Inside Diameter	Number and Type	Inside Diameter	Number and Type	Inside Diameter
AMERICAN MOTORS CORP.																													
Rambler American (Deluxe and Super)	Car	20	Cer	4-5½	Std	Cart	YF-2014-S	1	SB	1.4400	Aut	DE	OB	13	Ch	180	N	TF	12.0	11.0	Y	N	1 Mo	1¼	1 Mo	1½	N	.....
American (Custom)	Car	20	Cer	4-5½	Std	Hol	1908-FC	1	SB	1.4400	Aut	OB	N	13	Ch	195	N	TF	11.0	10.0	Y	N	1 Mo	1¼	1 Mo	1½	N	.....
Classic-6 (Cast Iron Block)	Car	20	Cer	4-5½	Std	Hol	1908-FC	1	SB	1.4375	Aut	DE	OB	13	Ch	195	N	TF	11.0	10.0	Y	N	1 Mo	1¼	1 Mo	1½	N	.....
Classic-6 (Aluminum Block)	Car	20	Cer	4-5½	Std	Hol	1908-FC	1	SB	1.4375	Aut	DE	OB	13	Ch	195	N	TF	10.5	9.5	N	N	1 Mo	1¼	1 Mo	1½	N	.....
Classic-8	Car	20	PE	4-5½	Std	Hol	2040	1	DT	1.4375	Aut	DE	N	13	Ch	180	In	TF	20.0	19.0	Y	Y	1 Mo	1½	1 Mo	1¾	N	.....
Ambassador	Car	20	PE	4-5½	Std	Hol	2040	1	DT	1.4375	Aut	DE	N	13	Ch	180	In	TF	19.0	18.0	Y	Y	1 Mo	1½	1 Mo	1¾	N	.....
CHECKER MOTORS CORP.																													
Checker Superba, Marathon	Car	22	Cer	3	Std	Zen	O-12469	1	SB	1.2500	Aut	DE	OB	4	Ch	170	Ex	C-T	13.0	12.0	Y	Y	1 Mo	1½	1 Mo	1½	N	.....
CHRYSLER CORP.																													
Chrysler Newport	Car	23	PE	4-5	N	Str	WWC3-188	1	DT	1.5625	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾[2]	1 Mo	1½	N	.....
Windsor	Car	23	PE	4-5	N	Cart	BBD-2923-SA	1	DT	1.5625	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾[2]	1 Mo	1½	N	.....
New Yorker	Car	23	PE	4-5	N	Cart	AFB-3108-S	1	FB	1.4375[1]	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾[2]	1 Mo	1½	N	.....
300-G	Car	23	PE	4-5	N	Cart	AFB-2903-S	2	FB	1.4375[3]	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾	1 Mo	1½	N	.....
De Soto	Car	20	PE	4-5	N	Str	WWC3-188	1	DT	1.5625	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾[2]	1 Mo	1½	N	.....
Dodge Polara	Car	20	PE	4-5	N	Str	WWC3-188	1	DT	1.5625	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾[2]	1 Mo	1½	N	.....
Dodge Dart Seneca, Pioneer, Phoenix-6	Car	20	P	4-5	N	Cart	BBS-3098-S	1	SB	1.6875	Aut	DE	N	14	CP	180	Ex	TS	14.0	13.0	N	Y	1 Mo	1½	1 Mo	1½	1 S	.....
Seneca, Pioneer, Phoenix-8	Car	20	PE	4-5	N	Str	WW15-43[4]	1	DT	1.4375	Aut	DE	N	14	CP	180	Ex	TS	21.0	20.0	Y	Y	1 Mo	1½	1 Mo	1½	1 Mo	.....
Dodge Lancer 170, 770	Car	13	P	4-5	N	Cart	BBS-3093-S	1	SB	1.5625	Aut	DE	N	14	CP	180	Ex	TS	12.0	11.0	N	Y	1 Mo	1½	1 Mo	1½	1 S	.....
Imperial Custom, Crown, Le Baron	Car	23	PE	4-5	N	Cart	AFB-3108-S	1	FB	1.4375[1]	Aut	DE	N	14	CP	180	In	TS	17.0	16.0	N	Y	1 Mo	1¾	1 Mo	1½	N	.....
Plymouth Savoy, Belvedere, Fury-6	Car	20	PE	4-5	N	Cart	BBS-3098-S	1	SB	1.6875	Aut	DE	N	14	CP	180	Ex	TS	14.0	13.0	N	Y	1 Mo	1½	1 Mo	1½	1 S	.....
Savoy, Belvedere, Fury-8	Car	20	PE	4-5	N	C-S	BBD-2921-S[5]	1	DT	1.4375	Aut	DE	N	14	CP	180	Ex	TS	21.0	20.0	Y	Y	1 Mo	1½	1 Mo	1½	1 Mo	.....
Valiant V-100, V-200	Car	13	P	4-5	N	Cart	BBS-3093-S	1	SB	1.5625	Aut	DE	N	14	CP	180	Ex	TS	12.0	11.0	N	Y	1 Mo	1½	1 Mo	1½	1 S	.....
FORD MOTOR CO.																													
Comet	Car	14	PE	4-5	Std	Hol	1908	1	SB	1.4370	Aut	DE	N	14	.....	178	N	TF	9.3	8.7	Y	Y	1 Mo	1¼	1 Mo	1¼	N	.....
Falcon	Car	14	PE	4-5	Std	Hol	1904	1	SB	1.4370	Man	DE	N	14	.....	178	N	TF	9.3	8.7	Y	Y	1 Mo	1¼	1 Mo	1¼	N	.....
Ford Fairlane, Fairlane 500, Galaxie-6	Car	20	PE	4-5	Std	Hol	.....	1	SB	1.5625	Man	DE	N	14	CP	178	In	TF	16.0	15.0	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Fairlane, Fairlane 500, Galaxie-8	Car	20	PE	4-5	Std	Fo	.....	1	DT	1.4375	Aut	DE	N	14	CP	178	Ex	TF	20.0	19.0	Y	Y	1 Mo	1¾	1 Mo	1¾	1 S	.....
Lincoln Continental	Car	21	P	5-6	N	Cart	ABD	1	DT	1.5620	Aut	DE	N	14	Ch	178	Ex	TF	25.0	22.0	Y	Y	1 Mo	1¾	1 Mo	1¾	1 S	.....
Mercury Meteor 600, 800-6	Car	20	PE	4-5	Std	Hol	.....	1	SB	1.5625	Man	DE	N	14	CP	178	In	TF	16.0	15.0	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Meteor 600, 800; Monterey-8	Car	20	PE	4½-5½	Std	Fo	.....	1	DT	1.4375	Aut	DE	N	14	CP	178	Ex	TF	20.0	19.0	Y	Y	1 Mo	1¾	1 Mo	1¾	1 S	.....
Thunderbird	Car	20	PE	4½-5½	N	Fo	.....	1	FB	1.5620	Aut	DE	N	14	CP	178	Ex	TF	20.5	19.5	Y	Y	1 Mo	1¾	1 Mo	1¾	1 S	.....
GENERAL MOTORS CORP.																													
Buick Special	Car	16	P	4-5¼	N	Roc	2GC	1	DT	1.3125	Aut	DE	N	15	Ch	168	Ex	TC	13.5	12.0	N	Y	1 Mo	1½	1 Mo	1½	N	.....
Le Sabre	Car	20	P	5-6¼	N	R-S	2GC[6]	1	DT	1.4375	Aut	DE	N	15	Ch	170	In	TC	18.5	17.0	N	Y	1 Mo	1¾[8]	1 Mo	1¾[8]	N	.....
Invicta, Electra, Electra 225	Car	20	P	5-6¼	N	R-C	4GC[7]	1	FB	1.5625[3]	Aut	DE	N	15	Ch	170	In	TC	18.5	17.0	N	Y	1 Mo	1¾[8]	1 Mo	1¾[8]	N	.....
Cadillac 60, 62, 63	Car	21	.....	5¼-6½	N	R-C	7019030[9]	1	FB	1.4375[3]	.....	DE	N	14	Ch	176	In	TC	19.3	18.7	Y	Y	1 Mo	1¾	1 Mo	1¾	N	.....
75	Car	21	.....	5¼-6½	N	R-C	7019030[9]	1	FB	1.4375[3]	.....	DE	N	14	Ch	176	In	TC	20.9	18.7	Y	Y	1 Mo	1¾	1 Mo	1¾	N	.....
Chevrolet Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	Car	20	MS	3½-4½	N	Roc	7013003	1	SB	1.5625	Aut	OW	OB	13	Bp	170	In	TC	18.0	17.0	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	Car	20	MS	5¼-6½	N	Roc	7019007	1	DT	1.4375	Aut	DE	N	13	Bp	170	In	TC	18.5	17.5	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Corvair 500, 700, 900	Car	14	MS	5¼-6½	N	Roc	7019101	2	SB	1.2500	Man	OW	N	AC															
Corvette	Car	16½	MS	5¼-6½	N	Cart	3779178	1	FB	1.3125	Aut	OW	DE	13	Bp	170	In	ACF	16.5	15.5	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Oldsmobile F-85	Car	16	PE	4-5¼	N	Roc	2GC	1	DT	1.3125	Aut	DE	N	15	Bp	170	In	TF	12.5	11.0	Y	Y	1 Mo	1½	1 Mo	1½	1 S	.....
88	Car	20	PE	5-6	Opt	Roc	2GC	1	DT	1.6875	Aut	DE	N	15	Ch	170	In	TC	20.3	19.3	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Super 88, 98	Car	20	PE	5-6	Opt	Roc	4GC	1	FB	1.5625[3]	Aut	DE	N	15	Ch	170	In	TC	20.3	19.3	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
Pontiac Catalina, Ventura, Star Chief	Car	25	PE	5¼-6½	N	Roc	7019060	1	DT	1.4380	Aut	DE	N	16	Ch	170	In	TC	19.5	18.5	Y	Y	1 Mo	1¾	1 Mo	1¾	N	.....
Bonneville	Car	25	PE	5¼-6½	N	Cart	AFB-3123-S	1	FB	1.4380[3]	Aut	DE	N	16	Ch	170	In	TC	19.5	18.5	Y	Y	1 Mo	1¾	1 Mo	1¾	N	.....
Tempest	Car	15½	P	4-5¼	N	Roc	7019061	1	SB	1.5700	Man	DE	N	14	Ch	170	In	TC	12.6	11.6	Y	Y	1 Mo	1¾	1 Mo	1½	N	.....
STUDEBAKER-PACKARD CORP.																													
Studebaker Lark-6	Car	18	PE	3½-5½	N	Cart	AS-3159-S	1	SB	1.2500	Aut	DE	OB	13	Ch	170	In	CT	12.0	11.0	Y	N	1 Mo	1¼	1 Mo	1¼	N	.....
Lark-8	Car	18	PE	3½-5½	N	Str	WW6-123-A	1	DT	1.2500	Aut	DE	OB	13	Ch	170	In	CT	18.0	17.0	Y	Y	1 Mo	1½	1 Mo	1½	N	.....
Hawk	Car	18	Cer	3½-5½	N	Str	WW6-123-A	1	DT	1.2500	Aut	DE	OB	13	Ch	170	In	CT	18.0	17.0	Y	Y	1 Mo	1½	1 Mo	1½	N	.....

ABBREVIATIONS

1—Primary only; secondary, 1.5625.
2—Water pump end only; radiator end, 1½.
3—Primary only; secondary, 1.6875.
4—Cars built in St. Louis use a BBD-2921-S.
5—Carter only; Stromberg, WW15-43.
6—Rochester only; Stromberg, WW.
7—Rochester only; Carter, AFB.
8—Water pump end only; radiator end, 1¾.
9—Rochester only; Carter, AFB-3177-S.
AC—Air cooled by forced air supply from centrifugal blower.
ACF—Aluminum cross flow.
Aut—Automatic.
Bp—Bypass.
Car—Carburetor.
Cart—Carter.
Cer—Ceramic.
Ch—Choke.
CP—Choke pellet.
CT—Cellular-tubular.
C-T—Cellular tube and fin.
C-S—Carter or Stromberg.
DE—Dry element.
DT—Dual throat.
Ex—External.
FB—Four-barrel.
Fo—Ford.
Hol—Holley.
In—Internal.
Man—Manual.
Mo—Molded.
MS—Metal strainer.
N—None.
OB—Oil bath.
Opt—Optional.
OW—Oil wetted.
P—Plastic.
PE—Paper element.
R-C—Rochester or Carter.
Roc—Rochester.
R-S—Rochester or Stromberg.
S—Straight.
SB—Single barrel.
Std—Standard.
Str—Stromberg.
TC—Tube and center.
TF—Tube and fin.
TS—Tube and spacer.
Y—Yes.
Zen—Zenith

STARTING AND IGNITION SYSTEMS

PASSENGER CAR MAKE AND MODEL	STARTING SYSTEM: MOTOR											STARTING SYSTEM: DRIVE			IGNITION SYSTEM: COIL				IGNITION SYSTEM: DISTRIBUTOR								
					Lock Test			No Load Test				Number Teeth					Amps.				Spark Advance Data (Crankshaft Degrees)						
																					Centrifugal Advance (at RPM)		Vacuum Advance (Inches of Mercury)				
	Make	Model	Engine Cranking Speed (RPM)	Test Conditions	Amps.	Volts	Torque (ft. lb.)	Amps.	Volts	RPM (min.)	Starting Procedure	Pinion	Flywheel	Flywheel Tooth Face Width	Make	Model	Engine Stopped	Engine Idling	Make	Model	Start	Maximum	Start	Maximum	Breaker Gap (in.)	Cam Angle (deg.)	Breaker Arm Tension (oz.)
AMERICAN MOTORS CORP.																											
Rambler American (Deluxe & Super)	AL	MEC-6002	NA	NA	285	4.0	6.5	48	10.0	5300	Tik	9	149	.438	AL	200613	3.00	NA	AL	IAT-4402-1	0°-850	14.0°-4000	0°-5.0	11.0°-11.0	.020	39	20
American (Custom), Classic-6	DR	1107201	NA	NA	385	3.5	10.5	112	10.6	3240	Tik	9	149	.438	DR	1115066	3.75	1.70	DR	1112434	0°-1000	22.0°-4200	0°-6.0	22.0°-16.5	.016	32	21
Classic-8	AL	MEC-6003	NA	NA	285	4.0	6.5	48	10.0	5300	Tik	9	149	.438	AL	200571	3.00	NA	AL	IPB-4107	0°-600	36.0°-3800	0°-6.0	20.0°-15.0	.017	30	20
Ambassador	AL	MDY-6009	NA	NA	405	4.0	9.0	60	10.0	4200	Tik	9	149	.438	AL	200571	3.00	NA	AL	IPB-4107	0°-600	36.0°-3800	0°-6.0	20.0°-15.0	.017	30	20
CHECKER MOTORS CORP.																											
Checker Superba, Marathon	AL	MDL-6023	250	EOT	225	4.0	6.0	60	10.0	3200	Tik	10	103	.500	AL		2.60	2.00	AL	IGC-6002	0°-550	18.0°-3350	N		.020	39	19
CHRYSLER CORP.																											
Chrysler Newport, Windsor	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005671	3.00	1.90	AL	IBP-4005-E	0°-700	22.0°-4100	0°-7.1	23.5°-16.0	.017	30	19
New Yorker	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005671	3.00	1.90	Chr	2095530	0°-800	19.0°-4600	0°-8.5	19.3°-15.0	.017	30	19
300-G	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005672	3.00	1.90	AL	IBS-4011	0°-800	20.0°-4800	0°-8.1	18.0°-14.5	.017	30	19
De Soto	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005671	3.00	1.90	AL	IBP-4005-E	0°-700	22.0°-4100	0°-7.1	23.5°-16.0	.017	30	19
Dodge Polara	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005673	3.00	1.90	AL	IBP-4005-E	0°-700	22.0°-4100	0°-7.1	23.5°-16.0	.017	30	19
Dodge Dart Seneca, Pioneer, Phoenix-6	AL	MDT-7002	150	CW	350	4.0	8.5	58	11.0	3800	Tik	9	146	.375	A-E	2005671	3.00	1.90	Chr	2095270	0°-700	23.0°-4400	0°-5.9	18.1°-12.0	.020	43	19
Seneca, Pioneer, Phoenix-8	Chr	1889100	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005671	3.00	1.90	Chr	2095647	0°-700	23.0°-4600	0°-8.0	27.0°-17.0	.017	30	19
Dodge Lancer 170, 770	AL	MDT-7009	150	CW	350	4.0	8.5	58	11.0	3800	Tik	9	148	.375	A-E	2005673	3.00	1.90	Chr	1889750	0°-800	25.0°-3850	0°-5.9	22.0°-14.5	.020	43	19
Imperial Custom, Crown, Le Baron	Chr	1889200	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005671	3.00	1.90	Chr	2095530	0°-800	19.0°-4600	0°-8.2	19.3°-15.0	.017	30	19
Plymouth Savoy, Belvedere, Fury-6	AL	MDT-7002	150	CW	350	4.0	8.5	58	11.0	3800	Tik	9	146	.375	A-E	2005673	3.00	1.90	Chr	2095270	0°-700	23.0°-4400	0°-5.9	18.1°-12.0	.020	43	19
Savoy, Belvedere, Fury-8	Chr	1889100	150	CW	350	4.0	8.5	78	11.0	3800	Tik	9	172	.375	A-E	2005673	3.00	1.90	Chr	2095647	0°-700	23.0°-4600	0°-8.0	27.0°-17.0	.017	30	19
Valiant V-100, V-200	AL	MDT-7009	150	CW	350	4.0	8.5	58	11.0	3800	Tik	9	148	.375	A-E	2005673	3.00	1.90	Chr	1889750	0°-800	25.0°-3850	0°-5.9	22.0°-14.5	.020	43	19
FORD MOTOR CO.																											
Comet	Fo	CODF-11001A	240	70F	54	4.2	14.0	50	12.0	9500	Tik	9	133	.375	Fo	FAC-12029-A	4.50	2.50	Fo	CODF-12127-A	N		0°-0	28.3°-5.4	.025	37	19
Falcon	Fo	CODF-11001A	240	70F	54	4.2	14.0	50	12.0	9500	Tik	9	133	.375	Fo	FAC-12029-A	4.50	2.50	Fo	CODF-12127-B	N		0°-0	28.3°-5.4	.025	37	19
Ford Fairlane, Fairlane 500, Galaxie-6	Fo	FAR-11001-A	165	85F	580	5.0	14.8	110	12.0	5200	Tik	9	146	.365	Fo	FAC-12029-A	4.50	2.50	F-H	FET-12127-C	N		0°-.3	23.0°-6.1	.025	37	19
Fairlane, Fairlane 500, Galaxie-8	Fo	FAR-11001-A	165	85F	580	5.0	14.8	110	12.0	5200	Tik	9	146	.365	Fo	FAC-12029-A	4.50	2.50	F-H	COAF-12127-A	0°-300	23.0°-4000	0°-1.0	25.0°-19.0	.015	27	19
Lincoln Continental	Fo	CIVF-11001-D	150	85F	525	4.0	14.0	70	12.0	9500	Tik	9	169	.375	Fo	FAC-12029-A	4.50	2.50	Fo	CIVF-12127-A	0°-700	30.0°-4000	1.0°-6.0	22.0°-18.0	.015	27	19
Mercury Meteor 600, 800-6	Fo	FAR-11001-A	165	85F	580	5.0	14.8	110	12.0	5200	Tik	9	146	.365	Fo	FAC-12029-A	4.50	2.50	F-H	FET-12127-C	N		0°-.3	23.0°-6.1	.026	37	19
Meteor 600, 800; Monterey-8	Fo	FAR-11001-A	165	85F	580	5.0	14.8	110	12.0	5200	Tik	9	146	.365	Fo	FAC-12029-A	4.50	2.50	F-H	COAF-12127-A	0°-300	23.0°-4000	0°-1.0	25.0°-19.0	.015	27	19
Thunderbird	Fo	FAR-11001-A	165	85F	580	5.0	14.8	110	12.0	5200	Tik	9	153	.375	Fo	FAC-12029-A	4.50	2.50	Fo	CISF-12127-A	0°-700	23.0°-4000	0°-7.0	15.0°-17.0	.015	27	19
GENERAL MOTORS CORP.																											
Buick Special	DR	1108303	160	EOT	.....	.....	NA	70	10.6	6750	Tik	9	156	.375	DR	1115136	3.70	2.10	DR	1110977	0°-625	28.0°-3700	0°-7.0	17.5°-16.0	.016	30	21
Le Sabre	DR	1107800	160	EOT	330	3.5	NA	100	10.6	3600	Tik	9	166	.573	DR	1115100	3.70	2.10	DR	1110961	0°-825	22.0°-3800	0°-9.0	17.5°-18.0	.016	30	21
Invicta, Electra, Electra 225	DR	1107876	160	EOT	330	2.0	NA	120	10.6	4700	Tik	9	166	.375	DR	1115100	3.70	2.10	DR	1110961	0°-825	22.0°-3800	0°-9.0	17.5°-18.0	.016	30	21
Cadillac 60, 62, 63, 75	DR	1107799	175	.....	330	3.5	NA	83	10.6	4350	Tik	9	166	.500	DR	1115152	2.40	1.25	DR	1110932	.8°-400	8.0°-2000	0°-9.0	11.3°-17.5	.016	30	21
Chevrolet Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	DR	1107688	.....	EOT	.....	.....	.....	63	10.6	6550	Tik	9	168	.414	DR	1115120	4.00	1.80	DR	1112403	0°-600	26.0°-3500	0°-6.0	22.0°-15.5	.019	32	21
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	DR	1107889	.....	EOT	.....	.....	.....	63	10.6	7800	Tik	9	168	.414	DR	1115115	4.00	1.80	DR	1110947	0°-600	28.0°-3750	0°-6.0	15.0°-15.5	.019	30	21
Corvair 500, 700, 900	DR	1108306	NA	EOT	NA	NA	NA	69	10.6	7675	Tik	9	147	.375	DR	1115135	4.00	1.80	DR	1110258	0°-400	32.0°-3600	0°-6.0	23.0°-15.2	.019	33	21
Corvette	DR	1107664	.....	EOT	.....	.....	.....	63	10.6	6200	Tik	9	168	.414	DR	1115091	4.00	1.80	DR	1110946	0°-600	28.0°-3700	0°-6.0	15.0°-15.5	.019	30	21
Oldsmobile F-85	DR	1108302	150	80F	NS	NS	NS	70	10.6	7675	Tik	9	156	.375	DR	1115137	4.50	2.00	DR	1110975	0°-800	26.0°-4200	0°-6.0	25.5°-16.0	.016	30	21
88	DR	1107665	150	80F	NS	NS	NS	83	10.6	3600	Tik	9	166	.500	DR	.....	4.50	2.00	DR	1110968	2.0°-800	24.0°-4400	0°-9.0	22.0°-21.0	.016	30	21
Super 88	DR	1107776	150	80F	NS	NS	NS	100	10.6	3900	Tik	9	166	.500	DR	.....	4.50	2.00	DR	1110968	2.0°-800	24.0°-4400	0°-9.0	22.0°-21.0	.016	30	21
98	DR	1107776	150	80F	NS	NS	NS	100[3]	10.6	3900	Tik	9	166	.450	DR	.....	4.50	2.00	DR	1110968	2.0°-800	24.0°-4400	0°-9.0	22.0°-21.0	.016	30	21
Pontiac Catalina, Ventura, Star Chief, Bonneville	DR	1107791	NA	RT	NR	NR	NR	75	10.3	6900	Tik	9	166	.410	DR	1115133	3.40	2.10	DR	1110971	0°-700	20.0°-3600	0°-7.0	20.0°-14.0	.016	30	21
Tempest	DR	1107796	NA	RT	NR	NR	NR	100	10.6	3600	Tik	9	150	.380	DR	1115138	3.50	3.40	DR	1110254	0°-650	26.0°-4250	0°-7.0	20.0°-14.0	.016	75	21
STUDEBAKER-PACKARD CORP.																											
Studebaker Lark-6	AL	MDU-7005	170	EOT	235	4.0	5.2	55	10.0	5200	Tik	9	151	.375	AL	200639	NA	4.00	AL	IAT-4403-B	0°-800	26.0°-1800	0°-8.0	16.0°-13.0	.020	39	20
Lark-8	DR	1107900	160	EOT	435	5.8	14.0	75	11.0	5000	Tik	9	162	.375	DR	1115154	NA	3.80	DR	1110969	0°-1000	26.0°-2200	0°-5.0	18.0°-13.0	.016	30	21
Hawk	DR	1107900	160	EOT	435	5.8	14.0	175	11.0	5000	Tik	9	162	.375	DR	1115154	NA	3.80	DR	1110864	0°-1000	26.0°-2200	0°-5.0	18.0°-13.0	.016	30	21

ABBREVIATIONS

1—Autolite only; Essex, 62-160-2.
2—Autolite only; Essex, 67-160-3.
3—Autolite only; Essex, 67-160-2.
A-E—Autolite or Essex.
AL—Autolite.
Chr—Chrysler.
CW—Completely warmed engine.
DR—Delco-Remy.
EOT—Engine at operating temperature.
F—Degrees fahrenheit.
F-H—Ford or Holley. **Fo**—Ford.
N—None. **NA**—Not available.
NR—Lock test not recommended.
NS—Not specified.
RT—Room temperature.
Tik—Turn ignition key to extreme clockwise position.

IGNITION TIMING, SPARK PLUGS, AND CLUTCHES

PASSENGER CAR MAKE AND MODEL	IGNITION TIMING		SPARK PLUGS				Cylinder Numbering System and Firing Order	Suppression Location	CLUTCH (PEDAL OPERATED)													
														Facing					Release Bearing			
	C/s deg. @ RPM	Mark Location	Make and Model	Thread (mm)	Tightening Torque (ft. lb.)	Gap			Make	Type	Type Pressure Plate Springs	Total Plate Pressure	Number of Driven Discs	Material	Inside Diam. (In.)	Outside Diam. (In.)	Effective Area (Sq. In.)	Thickness (In.)	Engagement Cushioning Method	Type	Method of Lubrication	Torsional Dampening Method
AMERICAN MOTORS CORP.																						
Rambler American (Deluxe and Super)	3B-	VD	AL-AL7[1]	14	30	.035	1,5,3,6,2,4	IW	BB	D	Co	1269	1	.....	5.4	8.0	55.2	.125	Cfs	Ba	P	Spr
American (Custom)	8B-	VD	Ch-H18Y[2]	14	30	.035	1,5,3,6,2,4	IW	BB	D	Co	1440	1	.....	5.1	8.5	72.2	.135	Cfs	Ba	P	Spr
Classic-6	8B-	VD	AL-AL7[1]	14	30	.035	1,5,3,6,2,4	IW	BB	D	Co	1446	1	.....	5.1	8.5	72.2	.135	Cfs	Ba	P	Spr
Classic-8	TC-	VD	AL-AL7[1]	14	30	.035	1L,4R,2R,2L,3R,3L,4L,1R	IW	BB	D	Co	1444	1	.....	7.0	10.0	80.1	.125	Cfs	Ba	P	Spr
Ambassador	TC-	VD	AL-AL7[1]	14	30	.035	1L,4R,2R,2L,3R,3L,4L,1R	IW	BB	D	Co	1893	1	.....	6.5	10.5	106.8	.125	Cfs	Ba	P	Spr
CHECKER MOTORS CORP.																						
Checker Superba, Marathon	4B-375	VD	Ch-UD16	18	34	.029	1,5,3,6,2,4	IC,GA,VR,GH	BB	D	Co	1638	1	Mo	6.5	10.0	90.7	.135	Pcs	Ba	P	SW
CHRYSLER CORP.																						
Chrysler Newport, Windsor	10B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	1675	1	MWA	6.5	10.5	106.8	.125	Cfs	Ba	P	CS
New Yorker	10B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
300-G	5B-500	.....	AL-A32	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	2200	1	MWA	6.5	11.0	123.8	.125	Cfs	Ba	P	CS
De Soto	10B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	1675	1	MWA	6.5	10.5	106.8	.125	Cfs	Ba	P	CS
Dodge Polara	10B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	1675	1	MWA	6.5	10.5	106.8	.125	Cfs	Ba	P	CS
Dodge Dart Seneca, Pioneer, Phoenix-6	2½B-500	.....	AL-AG52	14	31	.035	1,5,3,6,2,4	SP,IW	B-A	D	Co	1403	1	MWA	6.0	9.3	77.8	.125	Cfs	Ba	P	CS
Seneca, Pioneer, Phoenix-8	5B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	1799	1	MWA	6.8	10.0	85.5	.125	Cfs	Ba	P	CS
Dodge Lancer 170, 770	2½B-500	.....	AL-AG52	14	31	.035	1,5,3,6,2,4	SP,IW	BB	D	Co	1200	1	MWA	6.1	9.1	71.6	.125	Cfs	Ba	P	SW
Imperial Custom, Crown, Le Baron	10B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Plymouth Savoy, Belvedere, Fury-6	2½B-500	.....	AL-AG52	14	31	.035	1,5,3,6,2,4	SP,IW	B-A	D	Co	1301	1	MWA	6.0	9.3	77.8	.125	Cfs	Ba	P	CS
Savoy, Belvedere, Fury-8	5B-500	.....	AL-A42	14	31	.035	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW	BB	D	Co	1530	1	MWA	6.8	10.0	85.5	.125	Cfs	Ba	P	CS
Valiant V-100, V-200	2½B-500	.....	AL-AG52	14	31	.035	1,5,3,6,2,4	SP,IW	BB	D	Co	1200	1	MWA	6.1	9.1	71.6	.125	Cfs	Ba	P	SW
FORD MOTOR CO.																						
Comet	6B-500	.....	Ch-F14Y	18	25	.034	1,5,3,6,2,4	G,VR,FW,IW	Lo	D	Co	1200	1	Mo	5.4	8.5	68.1	.125	Spr	.....	P	Spr
Falcon	6B-500	.....	Ch-F14Y	18	25	.034	1,5,3,6,2,4	G,VR,FW,IW	Lo	D	Co	1200	1	Mo	5.4	8.5	68.1	.125	Spr	.....	P	Spr
Ford Fairlane, Fairlane 500, Galaxie-6	4B-500	VD	Ch-870	18	25	.034	1,5,3,6,2,4	G,VR,FW,IW	Lo	D	Co	1230	1	WA	6.0	9.5	85.2	.125	Tdv	Ba	P	SS
Fairlane, Fairlane 500, Galaxie-8	3B-500	VD	Ch-F14Y	18	25	.034	1R,1L,4R,4L,2L,3R,3L,2R	G,VR,FW,IW	Lo	D	Co	1278	1	WA	6.8	10.0	85.5	.125	Tdv	Ba	P	SS
Lincoln Continental	6B-465	VD	Ch-F11Y	18	25	.034	1R,1L,4R,2R,2L,3R,3L,4L	G,VR,FW,IW,GH	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mercury Meteor 600, 800-6	4B-500	VD	Ch-870	18	25	.034	1,5,3,6,2,4	G,VR,FW,IW	Lo	.....	Co	1230	1	WA	6.0	9.5	85.2	.125	Tdv	Ba	P	SS
Meteor 600, 800; Monterey-8	3B-500	VD	Ch-F14Y	18	25	.034	1R,1L,4R,4L,2L,3R,3L,2R	G,VR,FW,IW	Lo	.....	Co	1278	1	WA	6.8	10.0	85.5	.125	Tdv	Ba	P	SS
Thunderbird	6B-500	VD	Ch-F11Y	18	25	.034	1R,1L,4R,2R,2L,3R,3L,4L	G,VR,IW	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
GENERAL MOTORS CORP.																						
Buick Special	7½B-1050	HB	AC-45FFS	14	18	.033	1L,4R,2R,2L,3R,3L,4L,1R	IW,Co,G,VR	.....	D	.....	1230	1	Mo	6.0	9.5	42.6	.125	Spr	Ba	P	Spr
Le Sabre, Invicta, Electra, Electra 225	12B-400	HB	AC-44S	14	28	.033	1R,1L,4R,4L,2L,3R,3L,2R	IW,Co,G,VR	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cadillac 60, 62, 63, 75	5B-480	CB	AC-44	14	23	.035	1L,4R,2R,2L,3R,3L,4L,1R	G,Co,Bat,EG	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chevrolet Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	5B-475	Fly	AC-44	14	25	.036	1,5,3,6,2,4	IW	Chev	D	Dia	1525	1	Mo	6.0	9.5	85.2	.135	Spr	Ba	P	Spr
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	4B-	.....	AC-44	14	25	.036	1L,4R,2R,2L,3R,3L,4L,1R	IW	Chev	D	Dia	1788	1	WA	6.0	10.0	100.5	.135	Spr	Ba	P	Spr
Corvair 500, 700, 900	4B-500	CP	AC-46FF	14	25	.035	3R,2L,1R,3L,2R,1L	IW	Chev	D	Dia	975	1	WA	6.0	8.0	44.0	.135	Spr	Ba	P	N
Corvette	4B-	VD	AC-44	14	25	.036	1L,4R,2R,2L,3R,3L,4L,1R	IW	BB	D	Co	1620	1	WA	6.5	10.0	90.7	.135	Spr	Ba	P	Spr
Oldsmobile F-85	5B-850	.....	AC-46FF	14	15	.040	1L,4R,2R,2L,3R,3L,4L,1R	SP,IW,VR,Rad	Lo	D	Co	1230	1	WA	6.0	9.5	85.2	.137	WP	Ba	P	Co
88	5B-850	VD	AC-45	14	26	.030	1L,4R,4L,2L,3R,3L,2R,1R	SP,IW,G,VR,Rad	Lo	D	Co	1557	1	WA	7.0	11.0	113.0	.137	TP	Ba	F	Co
Super 88	5B-850	VD	AC-44	14	26	.030	1L,4R,4L,2L,3R,3L,2R,1R	SP,IW,G,VR,Rad	Lo	D	Co	1557	1	WA	7.0	11.0	113.0	.137	TP	Ba	F	Co
98	5B-850	VD	AC-44	14	26	.030	1L,4R,4L,2L,3R,3L,2R,1R	SP,IW,G,VR,Rad	N	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pontiac Catalina, Ventura, Star Chief, Bonneville	6B-490	CP	AC-45S	14	20	.036	1L,4R,2R,2L,3R,3L,4L,1R	IW,FW,G,VR,EG	BB	D	Co	2087	1	MWA	6.5	10.5	88.6	.125	Spr	Ba	P	Co
Tempest	6B-690	CP	AC-45S	14	20	.036	1,3,4,2	IW,FW,G,VR,EG	BB	D	Co	1477	1	MWA	6.0	9.3	65.6	.125	Spr	Ba	P	N
STUDEBAKER-PACKARD CORP.																						
Studebaker Lark-6	2B-550	VD	Ch-H14Y	14	28	.036	1,5,3,6,2,4	Co,GA,VR,DC	BB	D	Co	972	1	MA	6.1	9.1	72.0	.125	Pcs	Ba	P	SW
Lark-8	4B-550	VD	Ch-H14Y	14	28	.036	1L,4R,2R,2L,3R,3L,4L,1R	Co,GA,VR,Ro	BB	D	Co	1582	1	MA	6.5	10.0	90.6	.125	Pcs	Ba	P	SW
Hawk	4B-550	VD	Ch-H14Y	14	28	.036	1L,4R,2R,2L,3R,3L,4L,1R	Co,GA,VR,Ro,EG	BB	D	Co	1640	1	MA	6.5	10.5	.....	.140	Pcs	Ba	P	SW

ABBREVIATIONS

1—Or Autolite AL-82, ARL-82; Champion H-10, H-18Y
2—Or Autolite AL-82, ARL-82.
AC—A.C. Spark Plug Div.
AL—Autolite.
B—Before top center.
Ba—Ball.
B-A—Borg & Beck or Auburn.
Bat—Battery.
BB—Borg & Beck.
CB—Crankshaft balancer.
Cfs—Crimped flat springs.
Ch—Champion.
Chev—Chevrolet.
CP—Crankshaft pulley.
Co—Coil.
CS—Coil springs.
D—Dry.
DC—Distributor cap.
Dia—Diaphragm.
EG—Engine grounded.
F—Lubrication fitting.
Fly—Flywheel.
FW—Static collectors in front wheel.
G—Generator.
GA—Generator armature.
GH—Ground bonded at hood.
HB—Harmonic balancer.
IC—Ignition coil.
IW—Ignition wires.
L—Left bank.
Lo—Long.
MA—Molded asbestos.
Mo—Molded.
MWA—Molded woven asbestos.
N—None.
P—Pre-lubricated.
Pcs—Plate cushion springs.
R—Right bank.
Rad—Radio.
Ro—Rotor.
SP—Spark plugs.
Spr—Springs.
SS—Spring steel.
SW—Coil springs and friction washers.
TC—Top center.
Tdv—Torbend disc with vibration damper.
TP—Torbend plate.
VD—Vibration dampener.
VR—Voltage regulator.
WA—Woven asbestos.
WP—Waves in plate.

TRANSMISSIONS—Conventional and Conventional with Overdrive

PASSENGER CAR MAKE AND MODEL	TYPE			CONVENTIONAL TRANSMISSION												OVERDRIVE											
						Ratios					Lubricant										Lubricant						
													SAE Viscosity Number								SAE Viscosity					
	Manual	Manual with O.D.	Automatic	Shift Lever Location	No. of Forward Speeds	First	Second	Third	Reverse	Synchronous Meshing—Specify Gears	Capacity (pt.)	Type Recommended	Summer	Winter	Extreme Cold	Type	Manual Lockout	Downshift Accelerator Control	Minimum Cut-in Speed (mph)	Gear Ratio (to—1)	Capacity (pt.)	Separate Filler	Type Recommended	Summer	Winter	Extreme Cold
AMERICAN MOTORS CORP.																											
Rambler—American, Classic-6	Std	Opt	Opt	SC	3	2.61	1.63	1.00	3.54	ST	1½	MG[1]	80[1]	80[1]	80[1]	P	Y	Y	25	.700	1¼	Y	MG[1]	80[1]	80[1]	80[1]
Classic-8	Std	Opt	Opt	SC	3	2.57	1.55	1.00	3.49	ST	2¼	MG[1]	80[1]	80[1]	80[1]	P	Y	Y	25	.700	1¼	Y	MG[1]	80[1]	80[1]	80[1]
Ambassador	Std	Opt	Opt	SC	3	2.49	1.59	1.00	3.15	ST	4	MG[1]	80[1]	80[1]	80[1]	P	Y	Y	28	.722	.....	Y	MG[1]	80[1]	80[1]	80[1]
CHECKER MOTORS CORP.																											
Checker—Superba, Marathon	Std	Opt	Opt	SC	3	2.57	1.55	1.00	3.49	ST	2½	MP	90	90	80	P	Y	Y	26	.700	1¼	Y	MO	80	80	80
CHRYSLER CORP.																											
Chrysler—Newport, Windsor	Std	NA	Opt	F	3	2.55	1.49	1.00	3.34	ST	4¼	MP[2]	80[2]	80[2]	75[2]	N											
New Yorker	NA	NA	Std	N																							
300-G	Opt	NA	Std	F	3	2.55	1.49	1.00	3.34	ST	4¼	MP	90	(3)	(3)	N											
De Soto	Std	NA	Opt	SC	3	2.55	1.49	1.00	3.34	ST	4¼	MP[2]	80[2]	80[2]	75[2]	N											
Dodge—Polara	Std	NA	Opt	SC	3	2.55	1.49	1.00	3.34	ST	4¼	MP	80	75		N											
Dodge Dart—Seneca, Pioneer, Phoenix-6	Std	NA	Opt	SC	3	2.71	1.83	1.00	3.49	ST	5	MP[2]	80[2]	80[2]	75[2]	N											
Seneca, Pioneer, Phoenix-8	Std	NA	Opt	SC	3	2.12	1.43	1.00	2.73	ST	5	MP[2]	80[2]	80[2]	75[2]	N											
Dodge Lancer—170, 770	Std	NA	Opt	F	3	2.71	1.83	1.00	3.49	ST	5	MP[2]	80[2]	80[2]	75[2]	N											
Imperial—Custom, Crown, Le Baron	NA	NA	Std	N																							
Plymouth—Savoy, Belvedere, Fury-6	Std	NA	Opt	SC	3	2.71	1.83	1.00	3.49	ST	5	MP[2]	80[2]	80[2]	75[2]	N											
Savoy, Belvedere, Fury-8	Std	NA	Opt	SC	3	2.12	1.43	1.00	2.73	ST	5	MP[2]	80[2]	80[2]	75[2]	N											
Valiant—V-100, V-200	Std	NA	Opt	F	3	2.71	1.83	1.00	3.49	ST	14	MP[2]	80[2]	80[2]	75[2]	N											
FORD MOTOR CO.																											
Comet	Std	NA	Opt	.....	3	3.29	1.75	1.00	4.46	ST	2½	.....	80	80	80	N											
Falcon	Std	NA	Opt	.....	3	3.29	1.75	1.00	4.46	ST	2¼	.....	80	80	80	N											
Ford—Fairlane, Fairlane 500, Galaxie-6	Std	Opt	Opt	SC	3	3.20	1.86	1.00	3.88	ST	3	ME	80	80	80	P	Y	Y	28	.700	1¼	Y	ME	80	80	80
Fairlane, Fairlane 500, Galaxie-8	Std	Opt	Opt	SC	3	2.78	1.61	1.00	3.38	ST	3	ME	80	80	80	P	Y	Y	28	.700	1¼	Y	ME	80	80	80
Lincoln Continental	NA	NA	Std	N																							
Mercury—Meteor 600-6	Std	Opt	Opt	SC	3	3.20	1.86	1.00	3.88	ST	3	ME	80	80	80	P	Y	Y	27	.700	1¼	Y	ME	80	80	80
Meteor 800-6	Std	NA	Opt	SC	3	3.20	1.86	1.00	3.88	ST	3	ME	80	80	80	N											
Meteor 600-8	Std	Opt	Opt	SC	3	2.78	1.61	1.00	3.38	ST	3	ME	80	80	80	P	Y	Y	27	.700	1¼	Y	ME	80	80	80
Meteor 800, Monterey-8	Std	NA	Opt	SC	3	2.78	1.61	1.00	3.38	ST	3	ME	80	80	80	N											
Thunderbird	NA	NA	Std	N																							
GENERAL MOTORS CORP.																											
Buick—Special	Std	NA	Opt	SC	3	2.57	1.55	1.00	3.49	ST	2¼	MO	80	80	80	N											
La Sabre, Invicta, Electra, Electra 225	NA	NA	Std	N																							
Cadillac—60, 62, 63, 75	NA	NA	Std	N																							
Chevrolet—Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	Std	Opt	Opt	SC	3	2.94	1.68	1.00	2.94	ST	2	MP	90	90	80	P	Y	Y	27	.700	1	N	MO	90	90	80
Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	Std	Opt	Opt	SC	3	2.94	1.68	1.00	3.33	ST	2	MP	90	90	80	P	Y	Y	27	.700	1	N	MO	90	90	80
Corvair—500, 700, 900	Std	NA	Opt	F	3	3.50	1.99	1.00	3.97	ST	2	MP	80	80	80	N											
Corvette	Std	NA	Opt	F	3	2.47	1.53	1.00	2.80	ST	2	MP	90	90	80	N											
Oldsmobile—F-85	Std	NA	Opt	SC	3	2.57	1.55	1.00	3.49	ST	2	MP	80	80	80	N											
88, Super 88	Std	NA	Opt	SC	3	2.15	1.37	1.00	2.28	ST	2½	MP	80	80	80	N											
98	NA	NA	Std	N																							
Pontiac—Catalina, Ventura	Std	NA	Opt	SC	3	2.47	1.53	1.00	2.80	ST	1¾	EP	(3)	(3)	(3)	N											
Star Chief, Bonneville	Std	NA	Opt	SC	3	2.49	1.59	1.00	3.15	ST	2¾	EP	(3)	(3)	(3)	N											
Tempest	Std	NA	Opt	F	3	2.94	1.68	1.00	3.32	ST	3	MH	90	90	90	N											
STUDEBAKER-PACKARD CORP.																											
Studebaker—Lark-6	Std	Opt	Opt	SC	3	2.61	1.63	1.00	3.54	ST	2¼	MO	80	80	80	P	Y	Y	28	.700	⅞	Y	MO	80	80	80
Lark, Hawk-8	Std	Opt	Opt	SC	3	2.57	1.55	1.00	3.49	ST	3¾	MO	80	80	80	P	Y	Y	27	.700	¾	Y	MO	80	80	80

ABBREVIATIONS

1—Or SAE 20W engine oil.
2—Or automatic transmission oil, type A.
3—80 or 90.
EP—Extreme pressure.
F—Floor.
ME—Mild extreme pressure.
MG—Mineral gear lubricant.
MH—Mild hypoid.
MO—Mineral oil.
MP—Multi-purpose gear lubricant.
N—None.
NA—Not available.
Opt—Optional.
P—Planetary.
SC—Steering column.
ST—Second and third.
Std—Standard.
Y—Yes.

AUTOMATIC TRANSMISSIONS

PASSENGER CARS MAKE AND MODEL	TRADE NAME	Type	Method of Selection	SELECTOR PATTERN	GEAR RATIOS					Max. Upshift Speeds—Drive Range (mph)	Max. Kickdown Speeds—Drive Range (mph)	TORQUE CONVERTER			LUBRICATION	
					1st Speed	2nd Speed	3rd Speed	4th Speed	Reverse			Number of Elements	Max. Ratio at Stall at Engine RPM	Type of Cooling	Capacity—Refill (pt.)	Type Recommended
AMERICAN MOTORS CORP.																
Rambler	American	Flash-O-Matic	TCG	Lev	P,N,2[1],1[2],L,R	2.40	1.47	1.00	.....	2.00	53	69	3	2.12–....	AC	20	A
	Classic-6	Flash-O-Matic	TCG	PB	R,NS,D2[1],D1[2],L,P	2.40	1.47	1.00	.....	2.00	53	69	3	2.12–....	AC	20	A
	Classic-8	Flash-O-Matic	TCG	PB	R,NS,D2[1],D1[2],L,P	2.40	1.47	1.00	.....	2.00	51	66	3	2.12–....	WC	20	A
	Ambassador	Flash-O-Matic	TCG	PB	R,NS,D2[1],D1[2],L,P	2.40	1.47	1.00	.....	2.00	50	68	3	2.12–....	WC	22	A
CHECKER MOTORS CORP.																
Checker	Superba, Marathon	Dual Range	TCG	Lev	P,R,N,D2[1],D1[2],L	2.40	1.47	1.00	.....	2.00	60	40	3	2.10–....	AW	19	A
CHRYSLER CORP.																
Chrysler	Newport, Windsor, New Yorker	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	75	65	3	2.20–....	WC	22	A
	300-G	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	80	70	3	2.20–2025	WC	22	A
De Soto		Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	75	65	3	2.20–....	WC	22	A
Dodge	Polara	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.00	75	65	3	2.20–....	WC	19	A
Dodge Dart	Seneca, Pioneer, Phoenix-6	Torque Flite Six	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	69	61	3	2.20–....	WC	15	A
	Seneca, Pioneer, Phoenix-8	Power Flite	TCG	PB	R,N,D[3],L	1.72	1.00	.....	.....	2.39	75	65	3	2.20–....	WC	20	A
	Seneca, Pioneer, Phoenix-8	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	75	65	3	2.20–....	WC	19	A
Dodge Lancer	170, 770	Automatic 3-Speed	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	60	55	3	2.25–....	WC	15	A
Imperial	Custom, Crown, Le Baron	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	80	70	3	2.20-1925	WC	22	A
Plymouth	Savoy, Belvedere, Fury-6	Torque Flite Six	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	69	61	3	2.20–....	WC	15	A
	Savoy, Belvedere, Fury-8	Power Flite	TCG	PB	R,N,D[3],L	1.72	1.00	.....	.....	2.39	75	65	3	2.20–....	WC	20	A
	Savoy, Belvedere, Fury-8	Torque Flite	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	75	65	3	2.20–....	WC	19	A
Valiant	V-100, V-200	Automatic 3-Speed	TCG	PB	R,N,D[2],2[3],1[4]	2.45	1.45	1.00	.....	2.20	60	55	3	2.25–....	WC	15	A
FORD MOTOR CO.																
Comet		Ford-O-Matic	TCG	Lev	P,R,N,D[3],L	1.75	1.00	.....	.....	1.50	52	50	3	2.40–....	AC	12½	A
Falcon		Ford-O-Matic	TCG	Lev	P,R,N,D[3],L	1.75	1.00	.....	.....	1.50	52	50	3	2.40–....	AC	12½	A
Ford	Fairlane, Fairlane 500, Galaxie-6	Ford-O-Matic	TCG	Lev	P,R,N,D[3],Lo	1.75	1.00	.....	.....	1.50	50	46	3	2.60–....	WC	19	A
	Fairlane, Fairlane 500, Galaxie-8	Ford-O-Matic	TCG	Lev	P,R,N,D[3],Lo	1.75	1.00	.....	.....	1.50	57	54	3	2.60–....	WC	19	A
	Fairlane, Fairlane 500, Galaxie-8	Cruise-O-Matic	TCG	Lev	P,R,N,D2[1],D1[2],Lo	2.40	1.47	1.00	.....	2.00	67	62	3	2.10–....	WC	20	A
Lincoln Continental		Turbo-Drive	TCG	Lev	P,R,N,D2[1],D1[2],L	2.37	1.48	1.00	.....	1.84	65	61	3	2.10-1720	WC	23	A
Mercury	Meteor 600, 800-6	Merc-O-Matic	TCG	Lev	P,R,N,D[3],L	1.75	1.00	.....	.....	1.00	50	46	3	2.61–....	WC	19	A
	Meteor 600, 800; Monterey-8	Merc-O-Matic	TCG	Lev	P,R,N,D[3],L	1.75	1.00	.....	.....	1.00	57	54	3	2.60–....	WC	19	A
	Meteor 600, 800; Monterey-8	Multi-Drive	TCG	Lev	P,R,N,D1[1],D2[2],L	2.40	1.47	1.00	.....	2.00	67	62	3	2.10–....	WC	20	A
Thunderbird		Cruise-O-Matic	TCG	Lev	P,R,N,D2[1],D1[2],Lo	2.40	1.47	1.00	.....	2.00	75	68	3	2.10–....	WC	.....	A
GENERAL MOTORS CORP.																
Buick	Special	Turbine Drive	TCG	Lev	P,N,D[2],L,R	3.60	1.50	1.00	.....	3.60	66	60	3	2.50–....	AC	12	A
	Le Sabre, Invicta, Electra, Electra 225	Turbine Drive	TCG	Lev	P,N,D[5],L,R	1.82	1.00	.....	.....	1.82	No	No	5	3.40–....	WC	24	A
Cadillac	60, 62, 63, 75	Hydra-Matic	FCG	Lev	P,N,D1[6],D2[2],L[3],R	3.97	2.55	1.55	1.00	3.74	79	71	No	.....		18	A
Chevrolet	Biscayne, Biscayne Fleetmaster, Bel Air, Impala-6	Powerglide	TCG	Lev	P,R,N,D[3],L	1.82	1.00	.....	.....	1.82	53	40	3	2.10–....	WC	9	A
	Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	Powerglide	TCG	Lev	P,R,N,D[3],L	1.82	1.00	.....	.....	1.82	55	50	3	2.10–....	WC	9	A
	Biscayne, Biscayne Fleetmaster, Bel Air, Impala-8	Turboglide	TCG	Lev	P,R,N,D[1],Gr	2.67	1.63	1.00	.....	1.78	60	60	5	4.20–....	WC	4	A
Corvair	500, 700, 900	Powerglide	TCG	Lev	L,D[3],N,R	1.82	1.00	.....	.....	1.82	45	40	3	2.60–....	AC	6	A
Corvette		Powerglide	TCG	Lev	P,R,N,D[3],L	1.82	1.00	.....	.....	1.82	55	50	3	2.10–....	AC	9	A
Oldsmobile	F-85	Hydra-Matic	FCG	Lev	P,N,D[2],S[2],L,R	3.03	1.58	1.00	.....	2.52	60	53	No	.....	WC	12	A
	88, Super 88, 98	Hydra-Matic	FCG	Lev	P,N,D[2],S[2],L,R	2.97	1.56	1.00	.....	2.49	77	65	No	.....	WC	11	A
Pontiac	Catalina, Ventura	Hydra-Matic	FCG	Lev	P,N,DR1[2],DR2[3],L,R	2.97	1.56	1.00	.....	2.49	75	70	3	1.20–....	WC	12	A
	Star Chief, Bonneville	Hydra-Matic	FCG	Lev	P,N,DR1[6],DR2[2],L[3],R	3.97	2.55	1.55	1.00	3.74	75	70	No	.....	WC	18	A
Tempest		Tempest Torque	TCG	Lev	R,N,D[3],L	1.82	1.00	.....	.....	1.82	50	45	3	2.00–....	AC	4	A
STUDEBAKER-PACKARD CORP.																
Studebaker	Lark-6	Flightomatic	TCG	Lev	P,N,D[2],L,R	2.40	1.47	1.00	.....	2.00	62	53	3	2.15-1500	AC	18	A
	Lark-8	Flightomatic	TCG	Lev	P,N,D[2],L,R	2.40	1.47	1.00	.....	2.00	68	65	3	2.15-1600	AC	18	A
	Hawk	Flightomatic	TCG	Lev	P,N,D[1],L,R	2.40	1.47	1.00	.....	2.00	68	65	3	2.15-1800	AC	18	A

ABBREVIATIONS

1—Transmission goes through second and third speeds.
2—Transmission goes through first, second and third speeds.
3—Transmission goes through first and second speeds.
4—Transmission stays in first or low speed.
5—Transmission starts in direct drive.
6—Transmission goes through first, second, third and fourth speeds.
A—Automatic transmission fluid, type A.
AC—Air cooled.
AW—Air and water cooled.
D or **DR**—Drive range.
FCG—Fluid coupling with planetary gears.
Gr—Grade retarder or low.
L, Lo or **LO**—Transmission stays in first or low speed.
Lev—Lever.
N—Neutral. **No**—None.
NS—Neutral and/or start.
P—Park. **PB**—Push button.
R—Reverse. **S**—Super range.
TCG—Torque converter with planetary gears.
WC—Water cooled.

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METALS

With Steel Inventories at Low Levels, Industry Executives Predict Moderately Increased Production During 1st Quarter

By William F. Boericke

Better Prospects Seen for Steel

The steel industry closes the book for 1960 with almost unmitigated relief. Beginning the year with bright hopes of record production, with output of raw steel in January totalling 12 million tons and with the operating rate at 95 percent, it has seen production drop to less than 50 percent of capacity and the December output fall to an estimated 6 million tons.

Iron Age has commented wryly that except for low operations in 1958, this year's steel decline has been the longest and worst since the late 1930's. Another trade commentator declares that sentiment in the steel industry in December was at its lowest ebb for 25 years.

But the very severity of the decline in production presages that a turn for the better cannot be long-delayed. The National Association of Purchasing Agents predicts a 60 to 65 percent operating rate sometime in the first quarter of the new year. They were right in forecasting some months ago that the fourth quarter would show no improvement, so this more optimistic production carries no little weight.

Other steel executives concur. Chairman Roger M. Blough of U. S. Steel believes steel inventories of customers are as low as at the end of the 116-day steel strike, and doubts any appreciable further cut. Because of this, Mr. Blough thinks the prospect of an improved operating rate is much more substantial than anything to the contary.

Joseph L. Block, chairman of Inland Steel, predicts raw steel production in the first half of 1961 will rise about 10 percent from the last half of 1960. Republic Steel forecasts a first quarter rise of about 5 to 10 percent from the fourth quarter.

Inventory Cutting Appears Completed

These are not exciting forecasts, but are based on solid reasoning. Inventory cutting has been a prime depressing factor in forcing down steel output since July. At the end of the steel strike, inventories had been whittled down to 10-11 million tons. They had risen to about 18 million tons by May, but have since been slashed back to the old figure.

Normally steel inventories should equal a 60-day supply. But because of the business slowdown and the easy availability of steel from the mills and steel warehouses, customers have made no attempt to build up their own inventories.

Another reason has been their desire to slice inventories to the lowest point as the year end approached, in order to show a good cash position on the balance sheet. Again, seasonal factors play a part. Cold weather cuts down demand for structurals and galvanizing. These all totaled up to make December a slack month, even without the recession in general business.

Upturn May Be Slow

It is not expected that the upturn in orders in January will be any more than modest. It may take until February for the upturn to become definitely evident. It will result from the final cleanup of inventories, plus a seasonal increase in such lines as canning, appliances, and farm equipment.

Some uncertainty exists as to how strongly the automobile manufacturers will step up their steel buying. Naturally the answer depends a lot on how well the new models are accepted. One thing seems rather plain, that while the automobile industry will remain steel's largest customer, it won't swing all the weight it did before the advent of the compact, which uses 25 percent less steel than the standard model.

No Rise Ahead In Steel Prices

No one expected that base prices for steel would rise in December to recoup the increase in wage contract costs, which are variously estimated to amount to over $4 per ton of steel. In consequence the profit squeeze has tightened on the producers.

The best that is hoped is that if the operating rate gets into the 60's, some selective price increases may be seen on extras but not on base prices. It's definitely a buyer's market today.

Price cutting is rampant in steel centers, and prime warehouse steel has been offered in the Chicago area for as much as 40 per cent below list prices. Freight absorption is common. Some buyers have been offered sheet steel of excellent quality at prices usually quoted for secondary steel. Foreign competition is still strong, although prices have strengthened a little.

Scrap Market Firms Up

The scrap market has stiffened at long last, and No. 1 heavy melting scrap advanced to $27 a ton. It may indicate that the long steep decline in this key steel-making material has been arrested. But the new price is still well below former levels, and it is the lowest since 1954. Steel scrap is still definitely on the bargain counter.

The same can be said for iron ore. Cleveland Cliffs, a leading producer, announced a severe curtailment in its mining operations, due to rising competition from foreign iron ores—which, it is claimed, are pricing Lake Superior ores right out of the market. However, it was acknowledged there is a strong demand for high grade pelletized ore.

(*Turn to page* 65, *please*)

AIRBRIEFS

By R. RAYMOND KAY
PACIFIC COAST EDITOR

Defense Spending Step-up

The Kennedy Administration is bound to step up defense spending. There's a new urgency about it in light of the Russians' tough line.

This puts an effective floor under the aerospace industry.

Many programs now in the works will get more money. There's a good chance that in fiscal 1962, the Minuteman intercontinental ballistic missile project will get as much as another $1 billion.

Another project sure to get more money: North American Aviation's 2000 mph B-70 bomber. The government reinstated this program as a full weapon system. Industry experts place a $2 billion tag on the first wing of 62 aircraft.

Pentagon planners say that within the next ten years, the government's bill for air and space systems will jump from $11 billion to $18 billion. And ground support equipment will rise from $2 billion to almost $5 billion.

Spacecraft Step-up

Krafft A. Ehrcke, world-renowned rocket scientist, urges the U. S. to step up research on nuclear powered spacecraft. It's a must to prepare for the coming "super-energy" needs of deep interplanetary travel, he says.

Mr. Ehricke is program director for Centaur. It's this country's first liquid-hydrogen-powered space vehicle. Convair Div. of General Dynamics is building it for the National Aeronautics and Space Administration.

"We know now that chemical rocket fuel will be impractical for manned space travel beyond the moon. Nuclear reactors should be considered the principal propulsion systems for vehicles whose primary mission is no longer terrestrial space, but manned expeditions to the planets," Mr. Ehricke says.

Rocket-Powered Sled

Northrop is developing a rocket-powered monorail sled with unique braking system. Aim: to bring the vehicle to a safe stop from a speed of 2700 mph.

The sled tests guidance components. It simulates space flight with severe decelerations and accelerations.

Modified Trailer

An aerospace company is modifying a trailer for the U. S. Navy. It will serve as a mobile pilot-ready room. It can be moved to a new location at a moment's notice.

A complete ready room will consist of two 40-ft-long aluminum-skinned trailers, placed side by side or back to front. The units will have special air conditioning equipment to ventilate the pilots' fully-pressurized flight suits.

Project for Mars

At Boeing, there's talk about a monstrous space ship to Mars—a vehicle 24 stories high and weighing some eight million pounds. Estimated cost: $625 million.

But George Stoner, Boeing's program manager for the Dyna-Soar, a manned orbital space vehicle, cautions scientists against presenting their visions to the public as realities. He warns that space travel will not come easily or soon.

Cutting Research Searching

A recent aerospace industry-wide survey shows that aerospace engineers spend 7.3 hr per week looking for product and specification data.

How to reduce this non-productive time? The Convair/Pomona Div. of General Dynamics has come up with an answer. A company official says its plan will cut search time by 90 pct.

Here's how it works. More than 50,000 pages of product information from 1500 suppliers are recorded on 27 reels of microfilm.

To operate the system the engineer looks up the item he wants in a product index. This refers him to the magazine-reel which has the information.

He places the reel in a special "reader" and flips a switch. In seconds he sees the information he wants on a 13 x 13 in. screen.

A photo-copy device is built into the upper part of the screen. In 15 sec. he can make a black and white copy of the data.

• • •

Brief Airbriefs . . . . The X-15 may extend manned flight to over 4000 mph and 100 miles high. . . . The B-70 program may use about 8000 suppliers throughout the country.

Aerospace ground equipment is the new name for ground support equipment. . . . A squadron of F-106s uses 3200 ground equipment items.

The next decade's supersonic transports will need automatic maintenance checkout by electronic computers. . . . Steel surface coverings for today's aircraft are fabricated .006 in. thick. That's twice the diameter of a human hair.

Look for a spectacular rise in world-wide air cargo shipments. With the coming of the jets, the international flag lines have more space to carry cargo. And they're going all out to fill their cargo holds with bulk traffic. ■

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Vehicle Make	Weeks Ending Dec. 10	Weeks Ending Dec. 3	Year to Date 1960	Year to Date 1959
PASSENGER CAR PRODUCTION				
Total—American Motors	10,726	11,611	459,275	379,807
Chrysler	1,960	1,918	82,370	64,388
De Soto	.....	61	19,411	39,662
Dodge	3,873	3,280	354,575	174,054
Imperial	402	398	16,106	19,188
Lancer	592	830	47,578	.....
Plymouth	4,929	4,615	242,532	373,755
Valiant	3,552	2,715	224,759	10,699
Total—Chrysler Corp.	15,302	13,817	987,331	681,746
Comet	3,684	4,072	190,538	29,677*
Falcon	9,616	9,078	482,734	79,431
Ford	19,678	20,677	950,737	1,364,561
Lincoln	1,053	818	17,795	28,348
Mercury	3,815	2,817	153,805	146,864
Total—Ford Motor Co.	37,846	37,462	1,795,609	1,648,681
Buick	6,404	6,122	258,979	213,214
Buick Special	2,383	2,781	31,237	.....
Cadillac	3,634	3,452	149,864	129,629
Chevrolet	32,811	33,049	1,534,841	1,262,454
Corvair	4,919	6,516	242,045	60,809
Oldsmobile	6,918	6,887	345,882	341,837
Oldsmobile F-85	2,709	2,704	33,662	.....
Pontiac	7,133	6,242	399,410	365,105
Tempest	3,274	3,158	23,705	.....
Total—General Motors Corp.	69,985	70,913	3,017,625	2,373,048
Total—Studebaker-Packard Corp.	1,614	1,630	102,415	146,041
Checker Motors	125	112	6,670	4,998
Total—Passenger Cars	135,604	135,545	6,368,925	5,234,321
TRUCK AND BUS PRODUCTION				
Chevrolet	7,348	7,437	374,947	306,860
G. M. C.	1,351	1,360	96,953	71,476
Diamond T	17	33	2,403	5,215
Divco	60	60	3,448	3,604
Dodge and Fargo	837	1,403	67,369	67,377
Ford	8,772	8,635	318,599	316,875
F. W. D.	11	10	833	1,014
International	1,910	1,626	114,525	137,277
Mack	206	263	13,984	16,363
Studebaker	24	159	12,068	10,697
White	319	281	15,061	18,957
Willys	1,646	1,776	118,374	106,980
Other Trucks	70	70	4,125	3,741
Total—Trucks	22,571	23,113	1,142,689	1,086,436
Buses	60	75	3,925	2,427
Total—Motor Vehicles	158,235	158,733	7,515,539	6,303,184

* Edsel Production.

NEW FOREIGN CAR REGISTRATIONS*

OCTOBER

1960		1959	
Volkswagen	14,635	Volkswagen	11,621
Renault	3,496	Renault	8,745
Simca	1,460	Opel	3,282
Opel	1,381	Fiat	2,971
Mercedes Benz	1,289	English Ford	2,931
Triumph	1,253	Simca	2,423
Fiat	1,236	Vauxhall	2,010
Volvo	1,199	Triumph	1,967
English Ford	1,138	Hillman	1,853
Austin Healey	1,032	Volvo	1,446
All Others	9,585	All Others	13,006
Total	36,704	Total	52,255

TEN MONTHS

1960		1959	
Volkswagen	130,102	Volkswagen	94,782
Renault	57,557	Renault	74,414
Opel	23,473	English Ford	36,203
English Ford	22,038	Opel	33,479
Fiat	18,774	Fiat	32,680
Triumph	15,776	Simca	31,188
Simca	15,320	Hillman	24,456
Austin Healey	14,775	Triumph	20,136
Mercedes Benz	12,146	Vauxhall	19,880
Volvo	11,991	Volvo	15,715
All Others	112,020	All Others	128,414
Total	433,972	Total	511,347

TRACTOR SHIPMENTS

WHEEL TYPE

Hp. Ratings	October	Ten Months
9-34 belt hp.	1,604	22,396
35-39 belt hp.	1,910	19,332
40-49 belt hp.	3,604	27,611
50-59 belt hp.	2,864	33,604
60 belt hp. and over	3,844	24,076
Total—Wheel Type	13,826[1]	127,019[2]

TRACKLAYING TYPE

25-59 net engine hp.	869	6,801
60-89 net engine hp.	443	3,612
90-129 net engine hp.	205	3,370
130 net engine hp. and over	426	7,210
Total—Track Type	1,943[3]	20,993[4]

[1]—Valued at $35,766,000
[2]—Valued at $281,869,000
[3]—Valued at $17,965,000
[4]—Valued at $244,926,000

1960 NEW REGISTRATIONS*

Arranged in Descending Order According to the Ten Months, 1960 Totals

NEW CARS

Make	October 1960	September 1960	October 1959	Ten Months 1960	Ten Months 1959
Chevrolet	121,965	119,484	128,109	1,417,003	1,276,112
Ford	135,889	95,536	120,539	1,175,981	1,227,366
Plymouth	38,407	30,439	32,431	381,213	331,207
Rambler	31,628	31,416	26,127	359,049	302,787
Pontiac	32,458	27,564	39,208	331,537	340,592
Dodge	30,385	21,763	17,062	309,005	127,447
Oldsmobile	33,257	23,907	37,569	286,991	321,032
Buick	23,298	15,357	24,433	211,164	212,460
Comet	21,128	15,761	.....	124,058	.....
Mercury	10,484	10,918	14,404	123,976	130,126
Cadillac	13,241	9,489	13,557	121,092	121,052
Studebaker	6,972	8,126	11,056	91,374	110,536
Chrysler	7,156	4,653	5,294	64,600	53,427
De Soto	1,252	1,243	3,254	20,743	37,718
Lincoln	914	1,266	2,146	16,753	22,622
Imperial	1,758	894	2,190	13,115	14,853
Misc. Domestic	565	526	3,193	7,704	40,412
Foreign	36,704	40,441	52,255	433,972	511,347
Total—All Makes	547,461	458,765	534,847	5,489,330	5,181,096

NEW TRUCKS

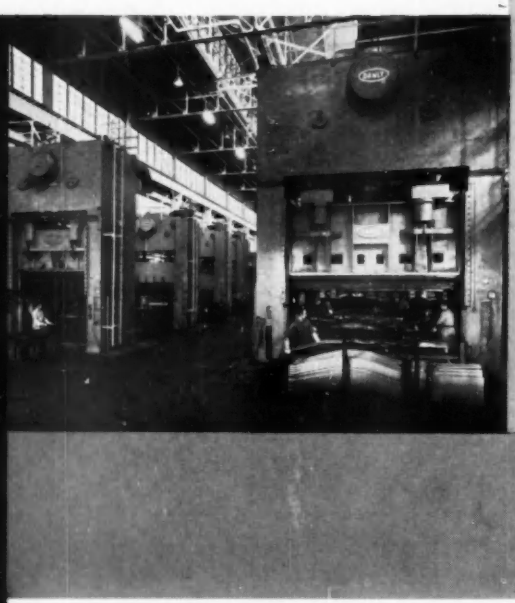
Make	October 1960	September 1960	October 1959	Ten Months 1960	Ten Months 1959
Chevrolet	23,977	22,226	23,764	266,303	274,358
Ford	22,254	25,498	25,444	242,576	244,495
International	8,108	9,207	9,925	94,378	89,031
G. M. C.	6,819	6,960	5,363	70,168	60,532
Dodge	3,769	3,260	4,289	36,491	45,233
Willys Truck	1,961	1,831	2,054	16,024	15,099
White	973	978	1,280	12,514	12,964
Mack	730	827	1,013	9,438	11,478
Willys Jeep	1,292	1,033	1,196	9,024	8,086
Studebaker	521	584	520	4,721	5,372
Diamond T	141	154	345	2,182	2,483
Brockway	77	68	118	917	977
All Others	3,536	3,644	3,609	36,035	35,008
Total—All Makes	74,158	76,072	79,920	802,771	805,716

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

Helping to make tomorrow's cars today...

Budd completes

A MILLION POUNDS PLUS OF STEEL are used each working day in Budd's Gary plant where underbodies and other parts are produced for American Motors. In this photograph, a Budd truck is delivering coil steel to the plant.



SOME 55,000 METAL STAMPINGS are turned out daily in the expanded Budd plant. New press lines like those shown in this photograph were a major part of the expansion program. Workers at right remove and stack underbody side rails.

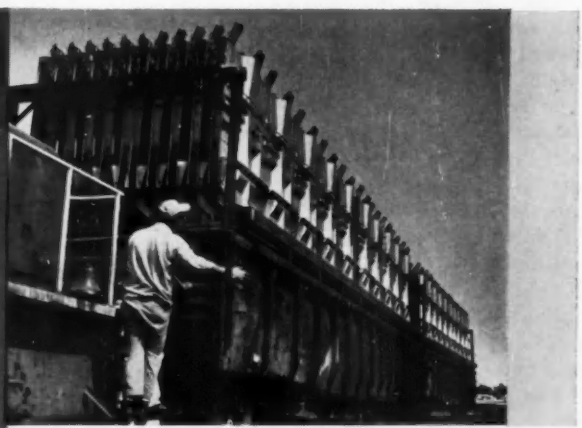
With the recently completed expansion of production facilities at our plant in Gary, Indiana, the Budd Automotive Division has taken another significant stride forward in ability to better serve the automotive industry. Manufacturing underbodies, fenders, doors, roofs and other parts for American Motors, the expanded plant employs some 2,200 men and women and has an annual payroll of nearly $16 million. It marks a major advance not only for the company and for all who work for us, but also provides new opportunities for even greater growth and progress in the months and years ahead. Part of a continuous program of expansion, it is one more example of how the specialized facilities and know-how of our Automotive Division are applied to the service of the Automotive industry.
The Budd Company, Automotive Division, Detroit 15.

major plant expansion

AUTOMOTIVE DIVISION
THE Budd COMPANY
DETROIT • MICHIGAN

WHEN YOU ARE IN DETROIT for the SAE International Exposition of Automotive Engineering, be sure to visit the Budd Exhibit adjacent to The Science Pavilion.

UP TO 800 UNDERBODIES PER SHIFT travel along this completely automated welding line, an all-important step in the production of American Motor's famed single-unit construction bodies. One of the most modern welding lines in the automotive industry, the line was built to Budd design.



SHIPPING OUT TO MILWAUKEE . . . Every day 1,600 underbodies are shipped from the Budd plant at Gary to the assembly lines at American Motors' Milwaukee plant. Here railroad brakeman signals his engineer as shifting engine moves down plant siding.

Circle 121 on Inquiry Card for more data

News of the MACHINERY INDUSTRIES

Estimated 1960 Expenditures for Plant and Equipment Exceeded Those in 1959 by Nearly 10 Per Cent. Predictions for 1st Quarter '61 Indicate Moderate Declines from 1960

By Charles A. Weinert

The Current Picture on Capital Expenditures

Plant and equipment expenditures by U. S. industry during the Year 1960 were about 10 per cent above those in 1959.

A "modest decline" from 1960 is forecast for the 1st Quarter '61—but the rates of expenditures in that period are expected to exceed those of 1958 and 1959.

The details, which follow, are contained in the latest report released by the U. S. Department of Commerce. They were compiled by the Department of Commerce and the Securities & Exchange Commission from a survey of businessmen that was conducted in late October and November. The 4th Quarter '60 figures, and to that extent those for the full year 1960, are therefore not yet final.

Plant and equipment expenditures by *all* U. S. business in 1960 totaled an estimated $35.74 billion. *Seasonally-adjusted annual rates* for the various quarters of the year ranged from $35.15 billion and $36.3 billion for the 1st and 2nd Quarters, to $35.9 billion and $35.6 billion (estimated) for the 3rd and 4th Quarters, respectively.

The 1960 overall total of $35.74 billion is close to 10 per cent above 1959's $32.54 billion, and 17 per cent over 1958's $30.53 billion.

For the 1st Quarter '61, capital investments by *all* U. S. business are expected to decline to a *seasonally-adjusted annual rate* of $34.9 billion, or 2.4 per cent from the total 1960 figure.

Capital outlays for 1960 of only those industries *manufacturing* durable and non-durable goods are computed at $14.45 billion—almost 20 per cent higher than 1959's $12.07 billion, and 27 per cent above 1958's $11.43 billion.

The makers of durable and non-durable goods expect to spend in the 1st Quarter '61 at a *seasonally-adjusted annual rate* of $14.3 billion, or one per cent less than the 1960 yearly total of $14.45 billion.

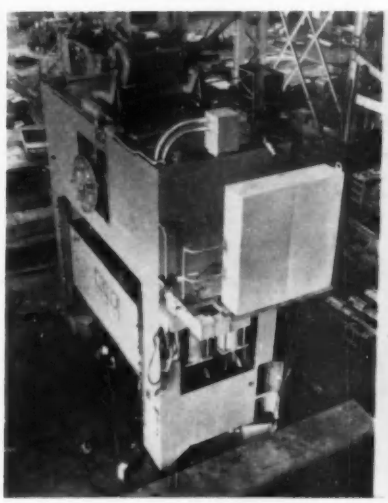
Capital expenditures in 1960 by producers of *motor vehicles and equipment* (included among the durable goods manufacturing industries) totaled about $890 million—39 per cent above 1959's $640 million, and 59 per cent above 1958's $560 million.

The manufacturers of motor vehicles and equipment forecast capital expenditures during the 1st Quarter '61 of $170 million, equivalent to a *seasonally-adjusted annual rate* of $800 million—exactly the same figures which applied during the 1st Quarter of 1960. The *seasonally-adjusted annual rate* for 1st Quarter '61 is 10 per cent less than 1960's *yearly* total of $890 million—but is 25 per cent above 1959's $640 million, and nearly 43 per cent above 1958's $560 million.

Machine Tool Builder Makes Proposal Charge

In the form of a recent notice to its customers, Brown & Sharpe Mfg. Co. has introduced an unusual, but which nevertheless seems to be an equitable and practical, method for discouraging non-productive inquiries.

Under the B&S arrangement, which went into effect last month, a purchase order must accompany



Four Bliss Presses Shipped to Peugeot of France

E. W. Bliss Co. recently completed four stamping presses for the Peugeot automobile factory in Sochaux, France. Disassembled and crated, the 39-ft-high presses, each weighing about 200 tons, were carried on flat cars from Canton, Ohio, to Philadelphia, where they were loaded aboard three ships. Purchased at a cost of nearly $750,000, the presses will be used by Peugeot to form body parts, such as fenders, roofs, hoods and trunk lids, for the Peugeot 403 (shown) and the new 404 that is to be introduced to the U. S. market this year.

each inquiry for an engineering proposal involving cams, tooling, or special attachments for automatic screw machines. Then a nominal charge of $15 will be made for each such engineering proposal on a part or print quoted upon—invoiced when the proposal is submitted.

However, when tooling is ordered based on the proposal, the charge will be credited to the customer's account. A refund also will be made if an order is placed for a machine or attachment as a result of the tooling quotation, even though the actual tools are not bought.

The B&S proposal will include the production rate, the sequence of operations, standard tools, cams, special tools, and any special attachments or arrangements necessary to complete the part—but will not include the layout.

B&S points out that bona fide inquiries culminating in an order will cost the customer no more than in the past. And that better customer service may be expected because the plan should eliminate much of the non-productive type engineering work which has been done heretofore.

Around the Industry

Bullard Co.—has licensed Kirloskar Brothers, Ltd., with offices in South Satara, India, to build Bullard vertical turret lathes and horizontal boring machines, and to act as agents in selling other Bullard machine tools in India and the Far East.

F. Jos. Lamb Co. — Alfred C. Ryan has been elected to the newly-created post of chairman of the board and treasurer. John K. Rye, former vice-president and general manager, is new president. Arlie C. McLee has resigned as treasurer, but will continue as a director.

Heald Machine Co.—Joseph W. Whitaker, Jr., has been named branch manager of the Heald Chicago office, succeeding Oliver A. Johnson who has retired. Walter R. Szarek is new branch manager of the company's New England territory, succeeding F. D. Gibbs who also has retired.

Meet the AI By-Liners

A brief biographical sketch of one of the editors and contributors to AI who participates regularly

Introducing

Howard Kohlbrenner

HOWARD KOHLBRENNER, Art Director of Chilton Company's Automotive Publications, is a graduate of the Philadelphia Museum College of Art, and of the Pennsylvania Academy of Fine Arts. He joined Chilton Co. in 1929 and became Art Director in 1938—having a service record of 31 years with the company.

As head of the Chilton Art Department he is concerned with the magazines AUTOMOTIVE INDUSTRIES, COMMERCIAL CAR JOURNAL, MOTOR AGE, and other Chilton publications.

Howard's vocation as well as his avocation is oil painting. He is particularly fond of abstract painting, as well as the study of abstract painting itself. One of his chief interests is research into historical subjects of Philadelphia, notably the lore surrounding old local inns and taverns. Of these subjects he has made a striking series of renderings in pen and ink. As a life member of the Old York Road Historical Society he has exhibited a number of these sketches of old inns in the Society's hall in Jenkintown, Pa.

Before joining Chilton, Howard free-lanced in the art field, and also was interested in dramatics. He has played with a number of top-rated amateur groups, and also professionally. His acting specialty, in which he excells, is character parts.

Howard has exhibited paintings and water colors in the Pennsylvania Academy of Fine Arts, and other galleries. He is a member of the Fellowship of the Academy and a member of the National Association of Art Directors.

Curtiss-Wright Corp.—has announced publication of a U. S. Air Force report "Machining Characteristics of High Strength Thermal Resistant Materials," covering studies made on the machining characteristics in turning, milling, drilling, and tapping of 25 high-strength thermal-resistance alloys. Copies are available from the Order and Contract Dept., Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J., at $4.60 each. ■

DYNAMIC DIESEL DRIVES

with Rockford Spring-Loaded Clutches

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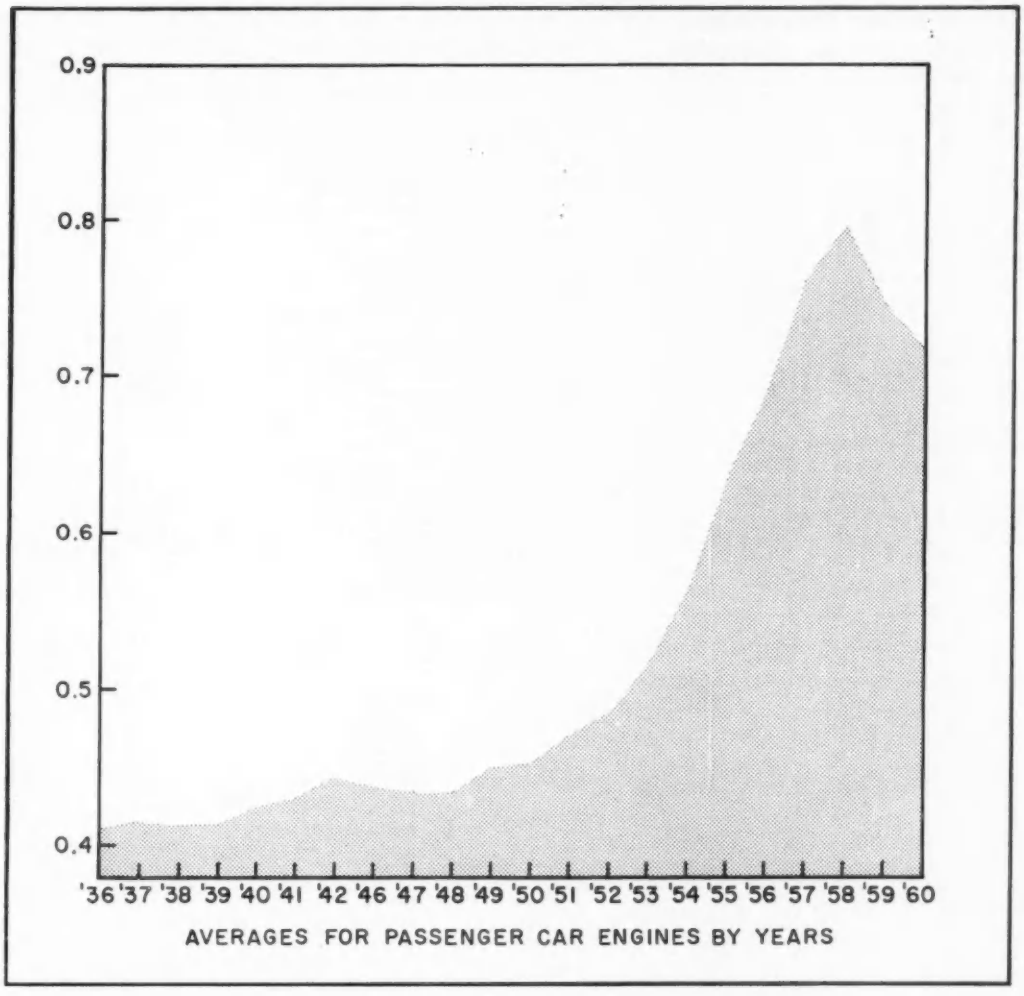
A.I. AUTO-TECHNICS DATA SHEETS

Basic Automotive Design and Production

TECHNICAL DATA FOR PERMANENT REFERENCE

Average Horsepower Per Cu. In. of Displacement, 1936-1960



Average Hp. per Cu. In of Displacement

1936	.411	1950	.455
1937	.417	1951	.474
1938	.412	1952	.488
1939	.415	1953	.518
1940	.426	1954	.564
1941	.431	1955	.639
1942	.446	1956	.691
1946	.440	1957	.765
1947	.437	1958	.797
1948	.437	1959	.746
1949	.453	1960	.717

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NEW PRODUCTION and PLANT EQUIPMENT

By C. J. Kelly
ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

4-Wheel-Drive Lift

FEATURING a 6000 lb capacity at 24 in. load center, and a 14 ft maximum stacking height, a new fork lift truck has been developed with 4 wheel drive. Known as the

model H-30, this unit is also available with a 21 ft lift. Standard forks are 48 in. long and are adjustable to 48 in. in width.

The rear (steering) axle mounting permits full axle oscillation of 18 deg enabling the machine to operate on uneven surfaces. The mast can be tilted 20 deg forward and 10 deg backward. All lift and tilt actions are hydraulically controlled with a three spool valve in a closed, pressure-controlled system. Three speed ranges are available with speeds up to 21 mph. *Frank G. Haugh Co.*

Circle 35 on Inquiry Card for more data

Press Safety Device

SAF-T-BLOC is the name given to a new device that has been developed to protect the operator, or maintenance man when servicing a power press die. The unit consists of three parts. A single base casting, with integral handle, houses a steel screw. The top of the screw is knurled to facilitate hand adjustment while on the press. A stop washer on the base of the screw prevents raising beyond a safe limit. The unit, which weighs approximately 11 lb, is available in various capacities and raises. *Duff-Norton Co.*

Circle 36 on Inquiry Card for more data

High-Speed Feed Unit

KEEPING a press running at top productivity is the function of a newly developed Flexofeed unit. This unit is designed to cover a wide range of feed lengths and speeds, with accuracy of ±0.002 in. On some applications, the manufacturer reports, coil stock can be fed at 2500 ipm, and blanks as high as 300 per minute. One manufacturer of automobile parts is stamping clutch plates for automatic transmissions on a 125 ton straight side flexopress equipped with a new flexofeed. This unit blanks out 5 in. steel circle from stock 0.040 in. thick. Production is reported to be 270 parts per hour. *Precision Welder and Flexopress Corp.*

Circle 37 on Inquiry Card for more data

Cost Saving Opportunities With New Spring Maker

Designed for manufacturing springs, clamps, clips, coils and related products, a new type machine has been introduced. With this unit a completely formed spring is fabricated in one cycle. It can make different end loops including extended hooks, and has the ability to make many types of springs. The load tolerance for the Baird Spring Generator, as it is known, is ±5 pct.

Circle 38 on Inquiry Card for more data

The machine will accept wire from 0.008 to 0.034 in. in diameter. Production rate with a variable speed drive is 720 to 6400 pieces per hour. The machine weighs 420 lb and occupies a floor space (less wire reel) of 22 by 27 in. Standard equipment includes a pedestal type base, 5 sets of feed change gears for feed lengths from 0 to 26 in., one set of standard cams, one set of standard cam inserts for extended hook springs and torsional springs, one quill setting gage and one set of gear and belt guards. The Baird Machine Co.

Hydraulic Transmission

CONTINUOUS duty is a feature of a newly developed hydraulic Transmission. This unit has a range of variable speeds from 0 to 1600 rpm. It was designed for heavy duty applications such as machine tool drives, lifts and conveyors. It can be driven at 1800 rpm, or less, with any 2 to 10 hp motor or a 20 hp gasoline engine. Speed selection is obtained by the rotation of a handwheel which covers all speeds in the entire range of the unit. The controls can be altered for remote control.

This transmission incorporates ball and roller bearings throughout. It weighs 100 lbs; is 22 in. in length (excluding shafts); 13 in. wide and 16 in. high. The input shaft has a diameter of 1⅜ in., while the output shaft is 1⅝ in. Both shafts are 4 in. long. *Roberts Electric Co.*

Circle 39 on Inquiry Card for more data

METALS

(*Continued from page 55*)

Aluminum Production Is Being Curtailed

The year just ended finds the aluminum industry in a less exuberant frame of mind than at the beginning of 1960. While the industry will still report a new annual tonnage record to mark the year, slightly exceeding 2 million tons, shipments of ingot will make a far less satisfactory showing. They have exceeded production in only two months of the January to October period.

In consequence, inventories of ingots held at the plants have just about doubled since last January. Producers have recognized the situation and started to curtail output, with more cuts in prospect. Such cuts have resulted in decreasing production by a combined total of some 425 tons a day.

A warning against expanding output too far beyond demand was voiced by the president of Aluminium Ltd. He pointed out that the U. S. primary aluminum industry alone has a capacity of 2.7 million tons, while the current level of U. S. primary consumption is a little over 1.9 million tons. As a result of possessing this excess capacity, aluminum has been offered around the world under fiercely competitive conditions, at prices that do not offer a fair profit, or indeed any profit at all.

Extrusion Sales and Prices Slide

Much the same is asserted by the president of the Aluminum Extruders Council, who said that extrusion prices have been lowered to a cost level or below it.

But basically the problem is one of slipping sales. Extrusion shipments for 1960 are estimated at 445,000 tons against 500,000 tons in 1959. In spite of this, the industry has continued to expand to an estimated full-time capacity of 1,250,000 tons a year. In an effort to bring in some return on invested capital business has been taken without much regard for overall costs, let alone a profit.

At the end of 1960, operational levels of the industry averaged slightly less than 80 per cent of capacity. This compares with about 85 per cent at mid-year.

In itself, over-capacity of the aluminum industry is no cause for alarm. To quote an industry leader, "Dynamic future growth can only be achieved if the industry's ability to supply is clearly demonstrated."

That there had been some roadblocks can't be denied. Some disappointment arises from a sharp decline in the mobile home and trailer manufacturing industry, which has slipped off about 20,000 tons in requirements for aluminum sheet and structurals. Inroads of aluminum into the container industry are slower than initially expected, and the same can be said for progress on aluminum engine blocks.

Aluminum Demand Is Strong Abroad

On the brighter side is the rapid growth of aluminum usage in Europe, which has risen to an annual rate of 730,000 tons. To meet the demand, imports from the U. S. have gained sharply. Without this demand from abroad it is likely that the domestic picture would have caused deeper concern.

Nor is there any reason to think that the call will become any less. Compared to an annual per capita use of aluminum in U. S. of 20.5 lb, European consumption averages scarcely one-third of this amount. German consumption in particular soared in 1960, and is estimated to be at the rate of 400,000 tons.

Tariff Concessions

In a major reversal of policy, Washington declares it is offering tariff concessions on aluminum and alloys imported into this country. The present duty on primary aluminum is 1¼ cents a pound.

All three of the major U. S. producers will fight the move at a Tariff Commission hearing in January. Independent fabricators and processors are in favor of it.

Specifically, the proposed tariff concession is designed to help Canada, as well as to soften up any tariff in the European Common Market on imports of aluminum. The present export price of unalloyed ingot, c. i. f. delivered foreign ports, is 23½ cents a pound, as contrasted with 26 cents destination U. S.

Domestic Market Slow for Copper

Copper buying has continued slow in the domestic market, but thanks to a good demand from the Continent, the smelters have been able to move their intake without further price reduction.

The London market remained surprisingly strong through mid-December at the equivalent of 29½ cents a pound, equal to about 31½ cents a pound in New York, with duty included. However, copper for 90-day delivery was offered ½-cent lower.

The strength in London was ascribed to a squeeze on shorts, as well as to uncertainty over continuous supplies from Africa and the prospect of another strike in Chile at Kennecott's Broden Mine which would interfere with expected production. There is also some belief that Russia has been buying copper in London as its own production is about 220,000 tons less than its requirements.

But on balance, the trade believes the foreign price is too high and will recede. Mine production still exceeds world demand by a substantial margin and world stocks continue to climb.

Brass Business Is Depressed

Business with the brass industries continues bad. No pickup is expected until Spring.

The brass mills expect business in 1961 to fall somewhat below the 1960 levels. Some executives expect their operations to move little over 1960 through the first quarter of 1961. Price cutting is still rampant. A prominent executive has said that in 1961 brass mill volume is expected to run 5 to 6 per cent below the 1960 rate. This sounds unduly pessimistic. Others expect a gain in the Spring. Much depends on an upturn in the steel industry, as brass demand is generally allied to activity in steel. ■

AUTOMATION NEWS REPORT

AUTOMATIC CONTROLS

PRODUCTION—VEHICLES—AIRCRAFT

By C. J. Kelly
ASSISTANT EDITOR

MACHINE COMBINES ASSEMBLY, LUBRICATION AND WELDING

Expert Welding Machine Company, of Detroit, has designed and built a ten station rotary index machine that combines welding, assembly and lubrication operations on ball joint assemblies. Expert reports a manufacturing cost savings, by the utilization of this unit, since the complete part is fabricated on one machine.

The machine automatically loads a ball joint body, applies the lubricant and then a bushing component is loaded into the ball joint body. At this point a stud and spring are manually loaded. A cap is pressed into the body automatically, after which the final automatic operation welds the component parts together to finalize a complete assembly. Reported production rates with this index machine is 300 parts per hour at 80 pct efficiency.

The index table is driven by a standard index drive which consists of a motor driven barrel cam that is used to engage a series of cam followers attached to the table drive plate. Shockless indexing time from station to station is one second.

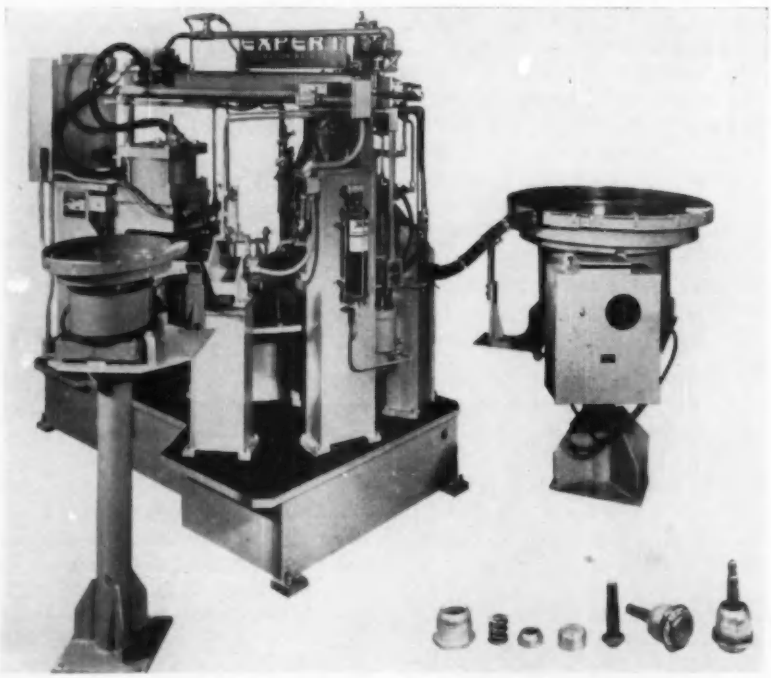
Machine Operation

Ten identical fixtures on the index table locate the ball joint body. Station one is loaded by a vibratory hopper. In the second location an air powered head positions a centrifugal lubricant applicator inside the ball joint body component. When in the correct place, the applicator spins and feeds a special lubricant compound to the desired area. After the specified amount has been dispensed the applicator stops spinning and retracts from the part.

Another vibratory hopper is employed in station three to feed the bushing to the body component where it is positioned in place. A stud and spring are manually loaded in number four. The assembly then is indexed through idle five to station six where the cap component is automatically pressed into position on the body section. Passing through idle seven the automatic CO_2 shielding arc welding operation is performed in the eighth station. At this station the cap is welded to the body component completing the ball joint assembly. After passing through idle nine the finished part is automatically unloaded at the final station, which is number ten.

Specifications

Approximate floor space required by the machine, which stands 7 ft tall, is 10 ft sq. It is totally air powered, electrically sequenced and the power for the cam drive is supplied by a 2 hp electric motor. ■

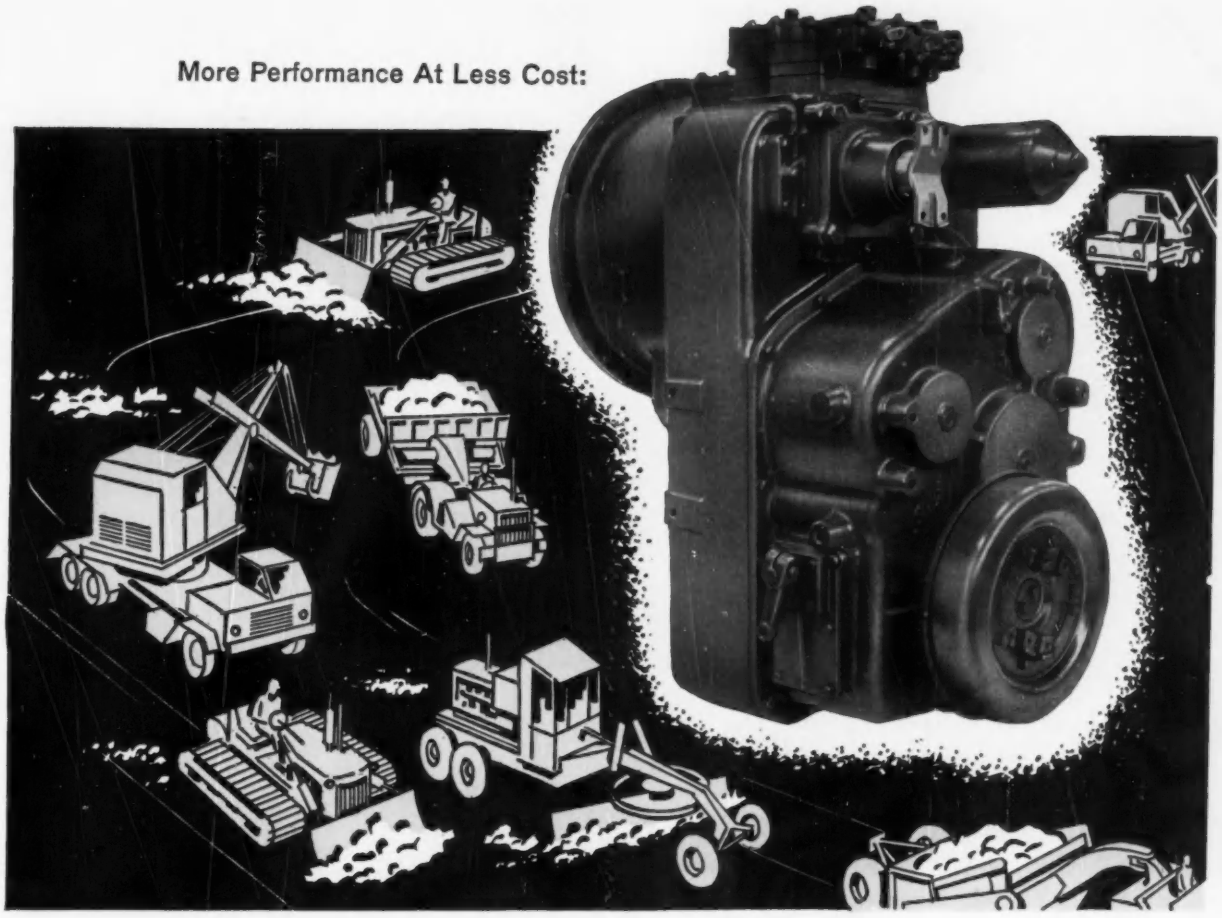


New 10 station automation machine completely fabricates ball joint assemblies

NUMERICAL CONTROL

Full numerical positioning control plus complete manual adjustment for error correction, tool wear, or material variations provides a highly versatile machine-tool control system combination called Specialmatic. This unit, referred to as "the shopman's control system," requires no external programming of tape or cards. It is offered by Specialties, Inc. The manufacturer reports setup time is approximately half the time required to setup a conventional turret lathe. Point-to-point rectilinear control of feed rates and dimensional end points at the control panel on the machine tool, plus a built in logical programming system, enables the setup man to work directly from the numerical dimensions on the blueprint. ■

More Performance At Less Cost:



HYDRA-DRIVES®
CDB POWER SHIFT TRANSMISSION

A torque converter...and 4-speed transmission in one compact package!

Proved in hundreds of vehicles for four years, these units assure top work output of heavy-duty equipment . . . at a lower initial cost than other models of comparable performance. Engine lugging and heavy shock loads are eliminated. A 3 to 1 torque multiplication makes starting fast and effortless—even with heaviest loads.

Just a flip of the operator's lever accomplishes power shifts within each range and without any interruption of the power flow.

With four speeds forward and reverse, the CDB Hydra-Drives Power Shift Transmission is ideally suited for vehicles which must travel in both directions during a normal work cycle. Rated at 550 ft. lbs. input torque, it can be used with a wide range of internal combustion engines up to 250 H.P.

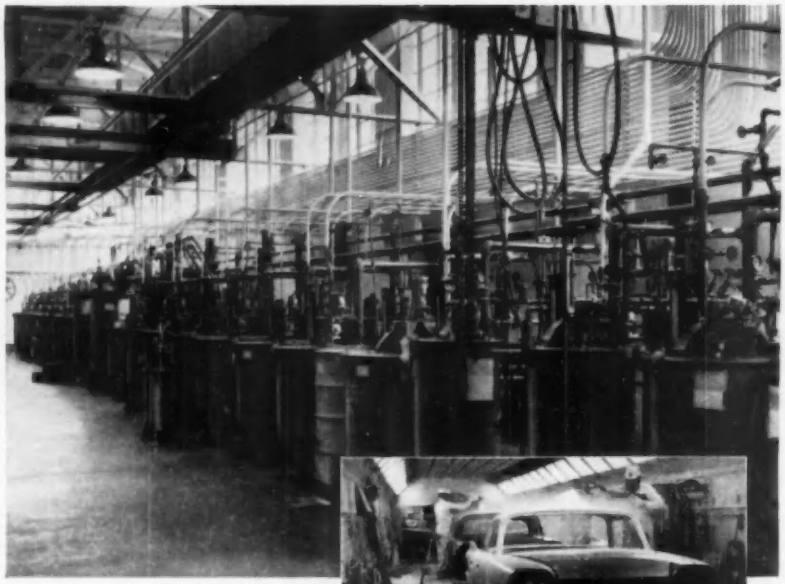
The CDB model illustrated above is used in connection with a size "C" drop box.

A BDB model is also available, for use with a size "B" drop box on equipment up to 175 H.P.

Another Product of... **ROCKWELL-STANDARD CORPORATION**

Transmission and Axle Division, Detroit 32, Michigan

Circle 123 on Inquiry Card for more data



at the Chrysler plant, St. Louis

Binks circulating system gives instant 24-color selection

In Chrysler's highly automated assembly plant in St. Louis, body units are channeled through spray booths at a rate of 960 per day. Chryslers, Valiants, Plymouths and Dodge Darts come through in any sequence and color changes are made almost from car to car. Spray operators must switch colors fast to keep production flowing.

Binks paint circulating system and spray guns make it easy to keep up with the fast moving line. With quick detachable fluid connectors, spray operators hook into any one of 24 colors in seconds. Fluid pressure in the system is automatically kept constant regardless of how many guns are in use.

Chrysler chose a Binks system for a very good reason . . . a similar system had already proved itself in their Evansville, Indiana plant. Although it is a custom installation the majority of units and accessories used are standard production items . . . an important factor in keeping costs down.

Send for bulletin today If you'd like to know how Binks circulating systems and spray equipment can economically automate your production lines . . . write today for Bulletin 701.

Ask about our spray painting school
Open to all...NO TUITION...covers all phases

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EVERYTHING FOR SPRAY PAINTING

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FORD STYLING
. . . AT WORK

(*Continued from page* 37)

seen on current model Fords. The Thunderbird became a passion with Walker, and he carried his "crisp" styling through both the two-passenger and four-passenger models. Walker says the crisp approach will carry into the next four model years at Ford.

Walker continued as a styling consultant for Ford for a decade. During that time styling, at the company, was a department in engineering. Then, in May, 1955, Walker was made a Ford vice president and the company's first director of styling.

BUILDING ORGANIZATION

WHEN he moved to Dearborn, Walker brought with him only two employes from his design studio, Elwood Engel and Joseph Oros. He gave his design business to the rest of his employes. Engel now is Staff Stylist, Walker's No. 2 man, and Oros is Chief Stylist in the Ford studio.

With these two men as his lieutenants, Walker built a styling staff that numbered 850 employes by 1957.

Now, the staff has 575, including about 500 productive workers and 75 in administration.

The styling office is divided into Ford production and pre-production studios, Lincoln-Mercury production studios, the advanced studio, interiors studio and fabricating services.

The Ford studios, with about 125 stylists, design Ford, Falcon, and Thunderbird passenger cars and station wagons, and Ford trucks. The L-M studios, with some 75 stylists, take care of Lincoln, Mercury and Comet automobiles. The advanced studio, with about 50, handles styling projects for Ford of Canada, Ford International, Tractor and Implement, and new Aeronutronic divisions. The advanced studio also does the down-the-road-type dream cars.

The 100-man interior studio works hand-in-hand with all other

(*Turn to page* 72, *please*)

Circle 124 on Inquiry Card for more data

Circle 125 on Inquiry Card for more data

Are You Getting What You Pay For?

When you pay for HIGH QUALITY high-carbon wire, you want to be sure you get it. You do, when it is supplied by Roebling.

It is unsurpassed in quality, consistently true to specifications, and absolutely uniform in gauge. Hundreds of manufacturers attest to this fact... the qualities that they *pay* for — they *get* in Roebling high-carbon wire. The length of our relationship with customers proves it.

We'll be glad to show you what we mean. For information on superior high-carbon wire or cold rolled strip, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

This lightweight "No Charge" spool is typical of Roebling's modern packaging methods that save customers time and money.

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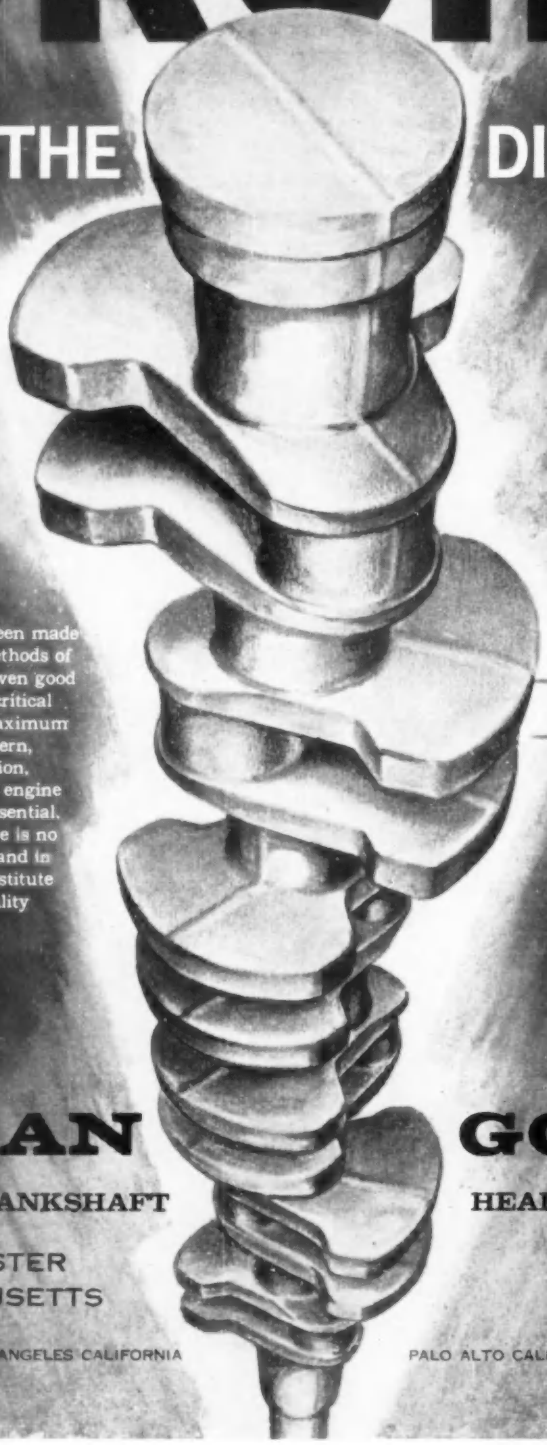

Crankshafts have been made successfully by other methods of fabrication and have proven good enough for certain non-critical applications—but for maximum dependability of the modern, compact, high-compression, high-torque, heavy-duty engine a forged crankshaft is essential.

In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

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NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

Reduced Size Pump

Featuring reduction in size, a new fuel injection pump has been introduced for application on engines with a displacement up to 330 cu in. for six cylinder models and 220 in the four cylinder type.

This new injection pump, called the Robert Bosch model M, is similar in configuration to previous inline injection pumps by this manufacturer. Designed to give long life and high injection speed, the model M has a single pumping element for each cylinder. This unit is currently being installed on the Mercedes-Benz 190D Diesel powered passenger cars. The manufacturer reports future deliveries are scheduled for other applications. *Robert Bosch Corp.*

Circle 40 on Inquiry Card for more data

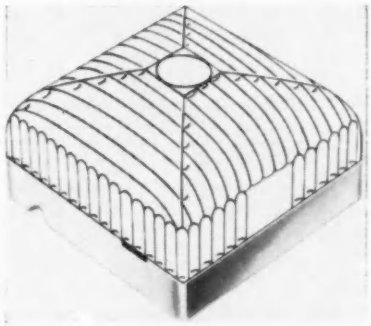
Ball Bushings

New ball bushings, designated INST-258 and INST-396, are for use on shaft diameters of 0.1246 and 0.1871 in. Overall dimensions are: OD—0.3125 in., length—0.5 in. and 0.375 in. and 0.562 in. respectively. They weigh only 0.15 and 0.30 oz. Despite small size, each bearing contains three complete ball circuits with each circuit containing 16 balls in the smaller and 17 balls in the larger ball bushing. Fabrication of precision ball circuits in this miniature size was made possible by the development of special milling techniques, using a 16 to 1 pantograph ratio. According to the manufacturer, these bushings possess all of the supersensitive characteristics of the larger and heavier instrument quality bushings. In addition, they are extremely rugged in construction and capable of withstanding high vibrational and shock loads. The precision manufacturing techniques, combined with the antifriction rolling design, assure minimum status and rolling friction together with a high degree of reliability and repeatability. *Thomson Industries, Inc.*

Circle 41 on Inquiry Card for more data

Clearance Marker

A completely new type clearance marker has been developed to fit in with the latest trend in truck and trailer design. Available in both square and oblong the light features a die-cast rustless base which provides



for inside and outside wiring. The color fast, red and amber lens are the pry-off and snap-on type. The unit is reported to exceed SAE specifications and to be marked and certified as meeting the ICC requirements. *K-D Lamp Co.*

Circle 42 on Inquiry Card for more data

Heavy-Duty Wiper

"Twenty-Twenty" is the name given to a new, heavy-duty electric windshield wiper unit which is designed to accommodate an arm 20 in. long carrying a 20 in. blade. It consists of an electric motor, a mounting bracket and an oscillating shaft with connecting drive linkage all consolidated into one unitized package.

Due to the availability of two crank arms with different lengths of throw, and four lengths of pivot shafts each provided with three crank pin holes, the device can be assembled to provide five different wiping angles and four pivot shaft lengths. The range available in the angles is from 68 to 127 degrees. Pivot shaft lengths are ⅝, 1, 2 and 3 in.

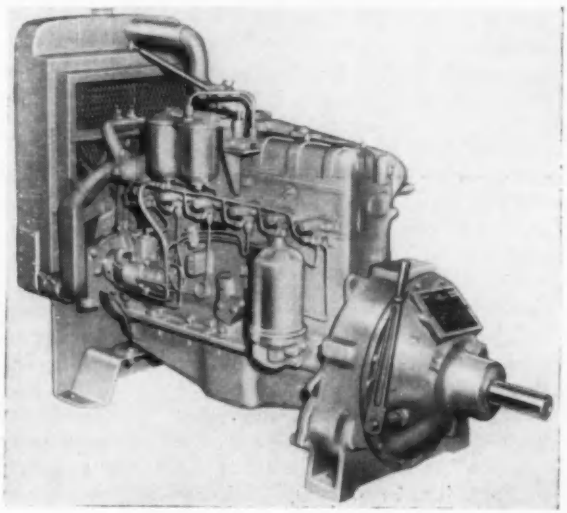
When equipped with a 20 in. arm and a 20 in. blade and assembled for a 127 degree wiping angle, the Twenty-Twenty will clear a 223 sq in. area of the windshield. *Commercial Sales Div., American Bosch Arma Corp.*

Circle 43 on Inquiry Card for more data

Diesel Engine for Industrial Applications

The Allis-Chalmers D-262 engine, now available commercially, is a six-cylinder, four-stroke Diesel which has a 3-9/16 in. bore and a 4⅜ in. stroke for a total piston displacement of 262 cu in. The electrical system is 12 V. Available are accessories which make the engine adaptable to a wide range of applications. The open powerplant consists of the engine assembly, radiator and engine support, exhaust pipe and clutch PTO, while the closed version includes a sheet metal hood and rear panel housing. Allis-Chalmers Mfg. Co.

Circle 44 on Inquiry Card for more data



FORD STYLING ... AT WORK

(*Continued from page* 68)

studios, correlating interior fabric and trim with exterior design and color.

Fabricating services produce the wood armatures, trim bucks, clay and plaster models, metal brightwork and other items that translate a design concept from the drawing board to the three-dimensional full-scale model. Some 150 are employed in the various shops of fabricating services.

Advanced studio actually is a catch-all. This studio currently is involved in a styling project for Ford's Aeronutronic Div.—designing a console for an Aeronutronic computer. All Canadian styling is done here (Frontenac, Meteor, Monarch cars and Mercury trucks), and consulting services are extended to Ford's English and German operations, although final decisions are made overseas.

PRODUCTION STUDIOS

THE two production studios work on projects that already have received management approval for production, just two or three years away. These studios, for instance, months ago delivered the 1962 models to engineering, and they are now well into '63 programs. In fact, the production studios are about to take over the 1964 proposals. Once the production studio's clay model has been approved for sheet metal, the car is on its way. A more permanent plaster cast is made from the clay, and cardboard templates are cut, then transferred to vellum. High-gloss white aluminum plates are made from the vellum, and the next step is production tooling.

The pre-production studios, meanwhile, are working four, five and six years ahead. Stylists in these two areas work mainly on themes, and a little "blue sky" imagination is permitted here. But their designs must not stray too far from the logical evolution of the product—a pre-production Mercury design should still resemble a production Mercury.

Sometimes a project is lifted out of the pre-production studio and rushed through for production. Ford did this with an advance design called the "Quicksilver," which was pushed through in 16 months to become the 1960 Ford car, a year ahead of schedule.

But the real Buck Rogers designs come from the advanced studio, where stylists plan as far as 10 years ahead. This is where furtive imaginations cook up land-sea-air vehicles, inter-city monorail systems, automatically controlled highway cars, and other futuristic designs. This is where dream cars like the La Galaxie, Futura, Mystere, X-2000 and X-100 were conceived.

The advanced studio serves some very basic and essential functions. Dream cars, for instance, are much more than just show cars and publicity gimmicks. These futuristic models often contain design elements that ultimately wind up on production cars. The X-2000, for example, featured a large chromed upright bumper, forerunner of Edsel's vertical grille. The X-100 had an air scoop on the hood, and large circular taillights, two features which turned up on the 1958 Ford. And the scalloped rear quarter of the XP-Turnpike Cruiser dream car of a few years back ended up on the 1957 Mercury.

As Walker says, "we can't show our new models to the public before they're introduced, but there's nothing to stop us from adding a little deceptive icing to the cake we may put on their plate a few years from now, and showing it to them now."

Following from this, we can expect certain design features from a dream car now in the works at Ford to end up on a 1963 or 1964 production model.

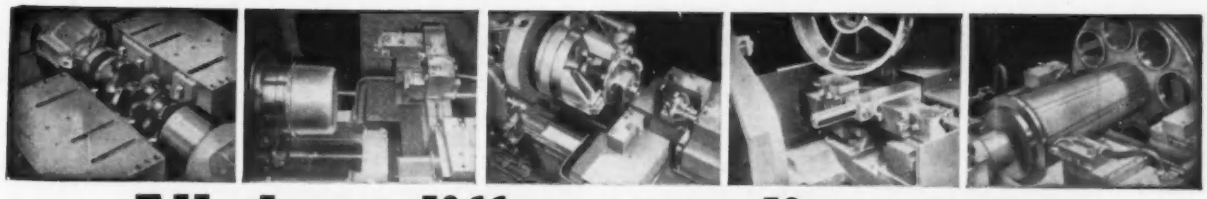
The advanced studio also tries to keep ahead of changing trends in the automobile and related industries. It must have a design ready for a major engineering breakthrough, such as a practical fuel cell or gas turbine. And a vehicle must be planned that will fit in with the radically different traffic patterns expected in the coming decades of rapid population growth. What kind of an automobile, for example, will be best suited to the congested conditions anticipated in the 1970's, when the nation will have more than 200 million persons and 70 million motor vehicles? Will the automobile continue to follow the historic concept of a rectangular box with a wheel at each corner, or will there be some unusual departure from this design?

TRENDS INTERPRETED

ANOTHER task of the advanced studio is to interpret trends in other fields that will influence car design. Higher consumer income and more leisure time, for instance, will mean that cars will be used more and more for pleasure and travel in the years to come. A significant trend that Walker says will affect passenger car design is the increasing number of retirees and other senior citizens who will be driving cars. Headroom, length, maneuverability, price and operating economy all will be influenced by this fast-growing market segment.

What will the car of the future be like? Walker confesses that he doesn't know for sure, although Ford is pretty well locked up for the next five years. There is going to be a substantial need for highly specialized vehicles to meet special kinds of individual and family requirements, he says. Acceptance of the compact cars may foreshadow the development of several new approaches to automotive products, although there will always be a market for larger cars. Modern super highways, growth of cities, the move to the suburbs, more leisure time—all of these and many other factors will combine to influence the design of the automobile.

In the final analysis, says Walker, the public will determine what the cars of the future will look like, and Ford stylists will give the public what they want. ■



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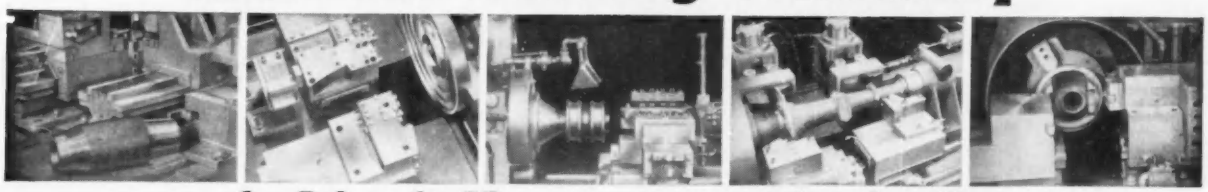

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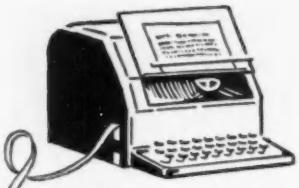


ON OUR WASHINGTON WIRE

Importers of cars, trucks, buses and other vehicles and parts have to meet new regulations for bonding shipments arriving in this country this year. Import bonds are required to insure that excise taxes are paid on all imported vehicles. They may be forfeited if an importer attempts to defraud the U. S. of taxes due, falsifies information on tax returns, or fails to pay taxes on time. In general, the bond must be equal to the amount of the tax which an importer expects to pay during an average calendar quarter.

A crash program to spur growth in areas of chronic unemployment is in the works. President-elect Kennedy, as he promised during the campaign, has a citizens' committee working on a model program for aid to depressed areas. The committee will try to point out ways to develop new job opportunities, remove roadblocks to full development of industrial potential, and stimulate investment in new industries. The program will be turned into legislation and will get quick action in Congress.

Government economists predict a gradual downtrend in plant and equipment outlays will persist beyond March, 1961. Department of Commerce and Securities and Exchange Commission officials say spending for factory expansion and modernization will dip to an annual rate of $34.9 billion in the first three months this year. Though plant and equipment outlays in 1960 were 10 per cent higher than 1959, they were four per cent lower than expected.

An underground battle over drastic defense reorganization plans has begun. It may end up being the first test of President-elect Kennedy's influence over Congress. High military leaders and their Congressional backers are preparing to fight the sweeping changes proposed by Sen. Stuart Symington (D., Mo.). One of the opposition's major arguing points is Sen. Symington's claim that reorganization could cut defense spending by $8 billion a year, more than 20 per cent of the defense budget. Non-military spending experts believe this figure is too high.

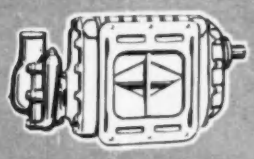
A bill giving business firms a one-year tax write-off of up to $1 million for new tools and equipment purchases will be introduced in Congress by Rep. Wright Patman (D., Tex.). The bill would have two basic parts: (1) enlarging present depreciation allowance to cover the first $1 million of newly acquired capital equipment and (2) shorten the depreciation period to one year.

SCHWITZER

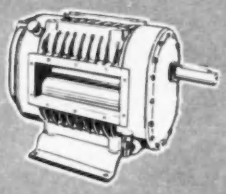
Fans

Fan Drives

Turbochargers



Superchargers



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world's largest plating supplier

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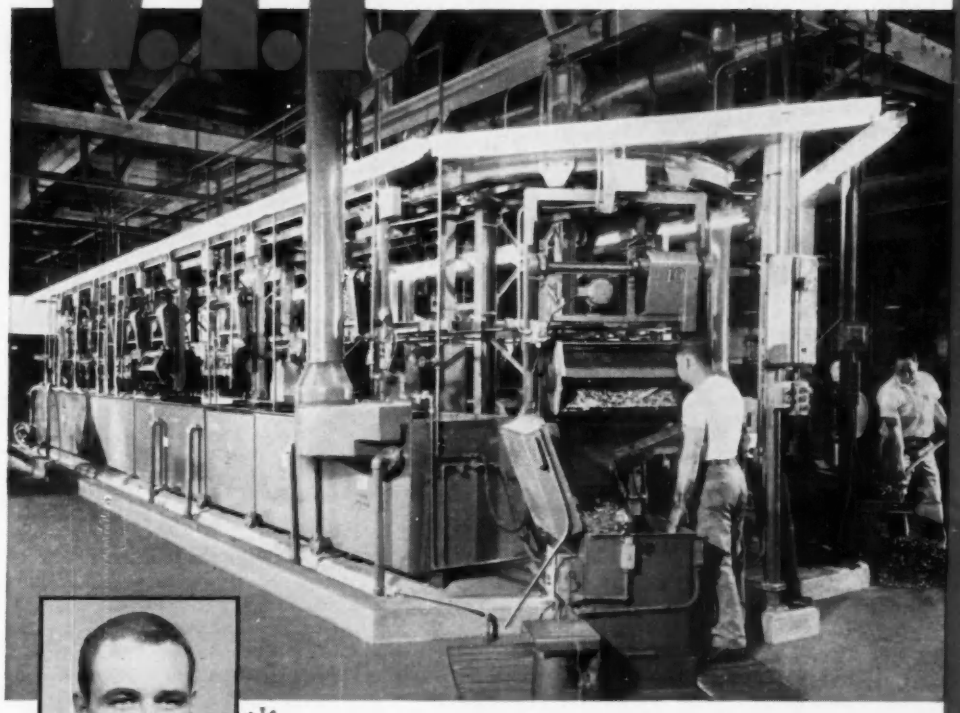

*Variable Integrated Processing steps-up production, improves plating efficiency for Chrome-Rite Company

Chrome-Rite Company, Chicago, Illinois, a large job plating shop, recently selected and installed a Udylite V.I.P. Automatic Barrel Plating Machine to replace a manual line for zinc plating bulk parts.

"We find that our direct labor cost has been cut 60% while the cost of materials has decreased approximately 15%", writes Bill Crawford, Vice President. "In addition, we are now able to handle about 99% of our zinc plating volume on the new V.I.P. and maintain an even more consistent high finish-quality than ever before."

Experienced plating men like Bill Crawford are quick to note the many production plating advantages of the V.I.P. You, too, should consult your Udylite Sales Engineer for complete information on the versatile V.I.P. Call him today. Or, write:

Udylite corporation
detroit 11, michigan

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Want low-cost parts finishing?

NOW—CHOOSE FROM

7 NEW ALMCO VIBRASHEEN MACHINES

TO DO YOUR

- DEBURRING
- DESCALING
- BURNISHING
- SURFACE REFINEMENT
- CLEANING

10 to 100 Times FASTER!

Note convenient height of controls.

IT'S A FACT! With the seven (7) new Almco Vibratory Machines, you can expect finishing time cycles 10 to 100 times faster than with standard horizontal barrel finishing equipment. It's a significant production breakthrough, made possible by creating constant vibratory motion to activate the entire mass of media and parts in the finishing container, as compared to only 20% activation with conventional barrel finishing methods.

The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configurations that can not be completely processed in standard horizontal barrel machines.

Investigate today, the ALMCO *Vibra-Sheen way!*

FREE

SEND FOR ALMCO'S NEW PRODUCT ALBUM

ALMCO

QUEEN PRODUCTS DIVISION
King-Seeley Corporation
261 E. Main St.
Albert Lea, Minnesota

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Manufacturers' News

Gear Buyers' Guide

The British Gear Manufacturers' Association has revised its buyers' guide of products manufactured by its members. Listed are makers of machine cut gears, enclosed gear drives and other power transmission equipment. Also included are companies which manufacture machines or tools for cutting gears or carrying out finishing operations on gear teeth.

Borg-Warner Acquires Seal Firm

Brummer Seal Co., Chicago Heights, Ill., manufacturer of mechnical seals for automotive engines, water pumps and other applications, has been acquired by the Spring Div. of Borg-Warner Corp. The seal concern will be known as Brummer Seal Div. of Borg-Warner Corp. but will be operated as a part of the Spring Div.

Enjay Office Moved

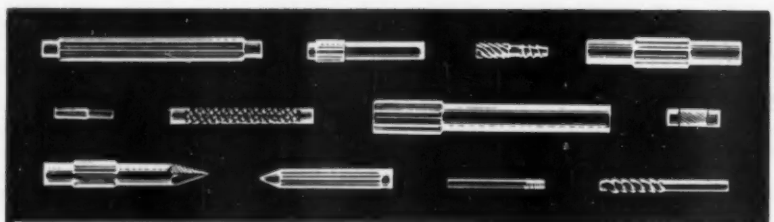
The Enjay Chemical Co. has moved its Detroit Automotive Development Group from 16301 W. Seven Mile rd. to 17360 W. Eight Mile rd., Southfield. Enjay's Southfield staff is headed by C. A. Coffey, manager. It is responsible for the development of new uses of Enjay products in the automotive industry.

Trailer Owners' Group

Formation of trailer travel clubs will be encouraged by Trailer Travelers of America, which is sponsored by Warner Electric Brake & Clutch Co. The group will provide information on planning trailer trips, traffic laws relating to trailers, safety suggestions, and tips on parking and maneuvering trailers. Col. Richard L. Hayes has been appointed association director.

Mobile Trade Fair Plan

The Isbrandtsen Co., Inc., a steamship line, is urging American manufacturers to join President Eisenhower in a drive to "beef up" our export trade. All expenses of shipping and exhibiting U. S. products will be borne by the steamship line. Officials say the idea can go a long way to help U. S. concerns regain their places in world export trade. Eight exhibits can be accommodated in each large container under the Isbrandtsen plan.



JOB-DESIGNED THREADED PINS FOR EVERY INDUSTRY

Hassall

Here is a fast, dependable, low cost, quality minded source of supply for JOB-DESIGNED threaded pins and fasteners of all types, in any metal, to fit your own particular assembly requirement. Recognize the fact that a fastener designed specifically to fill a seemingly complex assembly requirement can easily cost less than design modification to accommodate so-called standard fasteners. Assembly costs are a very major part of manufacturing expense. Most of this is labor. The fastening medium itself is usually a minimum item. If a Job-Designed fastener makes assembly simpler and faster, permits the use of fewer fasteners, allows the designer functional freedom and improves product efficiency, yours is a specifying job well done. All these possibilities are available when you come to Hassall for design assistance and quotation on challenging, difficult or unusual rivets, threaded nails, drive screws and other cold headed parts. Short or long runs, pilot quantities, engineering counsel, over 100 years of intimate association with cold heading—and a deep appreciation and regard for the concept of value analysis — all are a part of the Hassall service to you.

Send for a copy of our latest catalog.

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JOHN HASSALL, INC.

P. O. Box 2194 • Westbury, Long Island, N. Y.

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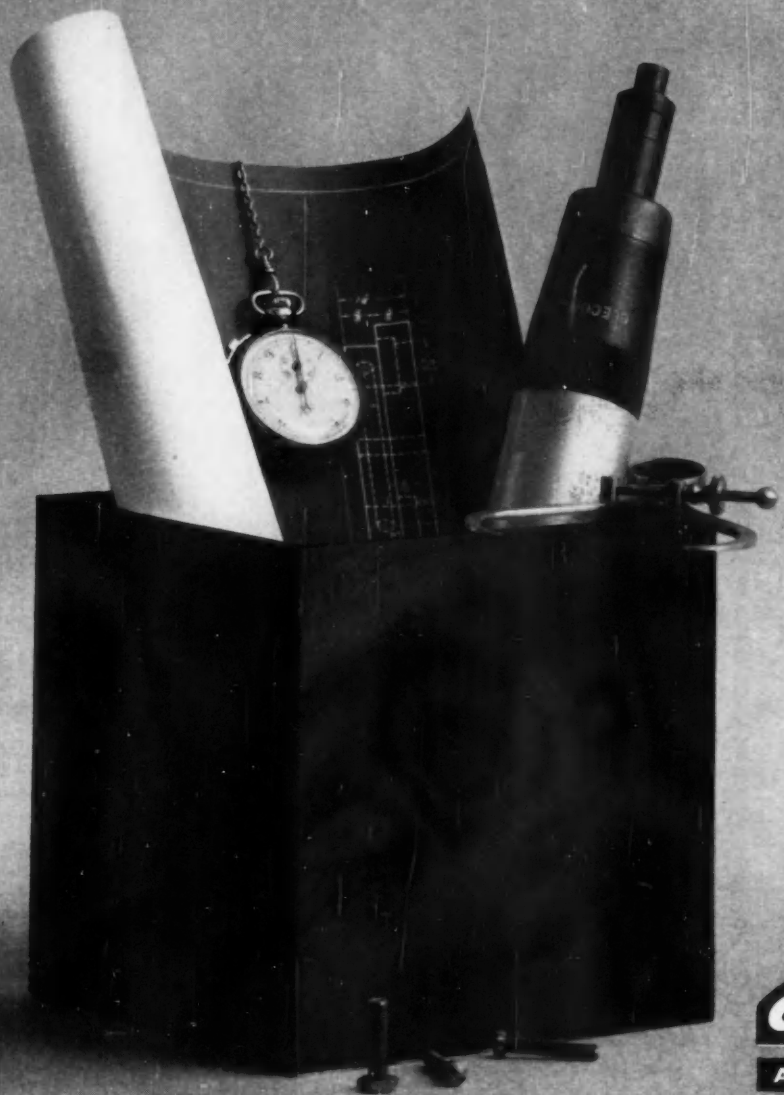
we admit it!

Cleco design engineers do stick their noses in your business!

Our design staff **does** know a lot about your operation. They have to. Their job is to design the air tools you need **almost before you need them.** They must design top performing tools that are simple to operate. Economical to maintain. Tools to stay on the job shift after shift. Tools that fit into the production plans of automated factories . . . specialized, custom-production operations as well. What's more, Cleco tool designers must think quality all the way, because every Cleco air tool has built-in quality. It's part of the Cleco® "Quality Control Package."



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AIR TOOLS

"quality tools engineered for industrial progress"

A Division of REED ROLLER BIT COMPANY • P. O. BOX 2119 • HOUSTON 1, TEXAS, U.S.A.
IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto), Ontario

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1. First with controlled-reactivity, vinyl-containing silicone rubber.
2. First non-volatile DTBP catalyst system for controlled reactivity rubber, making possible one-step, thick-section cures.
3. First pre-conditioned rubber compounds for easier, faster processing and production.
4. First with electrically conductive silicone rubber for electronic shields and electric heaters.
5. First with silicone rubber for fusible tapes for electrical machinery, hot-air ducting, and other wrapped constructions.
6. First with silicone rubber compound for direct feed from carton to extruder.
7. First complete silicone rubber masterbatch system enabling fabricator to design his own compounds.
8. First commercial silicone compound for high altitude oxygen masks.
9. First and only silicone rubber compound qualified for automotive rear pinion seal.
10. First silicone rubber compound to meet strict naval cable specifications for atomic submarines.

SOME SILICONE RUBBER "FIRSTS"...WHERE YOUR SILICONES MAN PLAYED THE LEAD

The combined technical and research facilities of Union Carbide Corporation, with tremendous resources of chemical experience and knowledge, have brought about outstanding achievements in silicone rubber. Ten of these contributions, which industry has enthusiastically accepted, are depicted on our film strip here.

Important thing to remember: Whenever you need the strikingly superior advantages of silicone rubber, see your UNION CARBIDE Silicones Man first. Advantages such as low temperature flexibility, thermal and oxidation stability at very high temperatures; low compression set; weather, ozone, oil resistance; electrical resistance or conductivity. Your Silicones Man has them all at his fingertips. Write Dept. AB-9002, Silicones Division, Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y. *In Canada:* Union Carbide Canada Limited, Bakelite Division, Toronto 12, Ontario.

Unlocking the secrets of silicones
Rubber, Monomers, Resins, Oils, Emulsions

The term "Union Carbide" is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE SILICONES

Remember when . . .

TOMMY MILTON WON THE ONE HE VOWED HE'D WIN

It's 1909, and 16-year old Tommy Milton sees his first auto race at the new Indianapolis Speedway. As the racers flash by, he tells his brother, "I'll win a race here some day." In following years Tommy became a real pro of the race tracks and his vow came true in 1921 when he roared through the 500-mile Indianapolis grind at an average speed of 89.62 m.p.h.

What drives pros on to repeated successes in sports or in business? It's determination, backed by skill and experience.

Timken Company sales engineers are the pros in their field. They are pros because they have accumulated the most skill and knowledge in the design and mounting of tapered roller bearings—have the finest technical staff and facilities in the business to call upon. And you know you'll get reliable bearing performance. Reliability backed by the Timken Company that assures you and your customers the higher performance standards for parts demanded by today's lengthened warranties.

Why not get the most for your bearing money? Call in the pros of the bearing business—Timken Company sales engineers. The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.

TIMKEN®

tapered roller bearings

from the pros of the bearing business

See Us At The S.A.E. Show, Cobo Hall, Detroit, Michigan, January 9-13, Booth 806.

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Circle 137 on Inquiry Card for more data ⟶

A "live" demonstration from Brown & Sharpe...

"Let me show you how Brown & prevents mixups in steel

...Mr. James R. Scott, Metallurgist, Heat

"Brown & Sharpe puts this smooth blue finish on its Ready Mark® flat stock to solve three problems tool and die makers and heat treaters have had for years...

FIRST: *To prevent mistakes in the type of steel* picked up for a job. The blue color gives permanent identification, no matter how small the piece.

SECOND: *To protect the steel indefinitely from rust.*

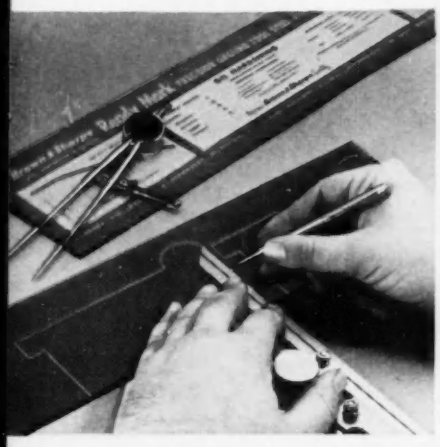
THIRD: *To save layout time by giving you a pre-colored surface,* all ready for scribing.

"Saves thousands of dollars a year in cracked dies and other spoiled work that a mixup in steel and hardening can cause! You can't mistake this A.I.S.I. Type 01 Oil Hardening Tool Steel for any other. It's always *blue.*

"And look at the automatic rust protection. Ready Mark's .0002"-thick 'Endurion' finish has better corrosion resistance for its thickness than any other known commercial finish. It can lie around for years, in good condition.

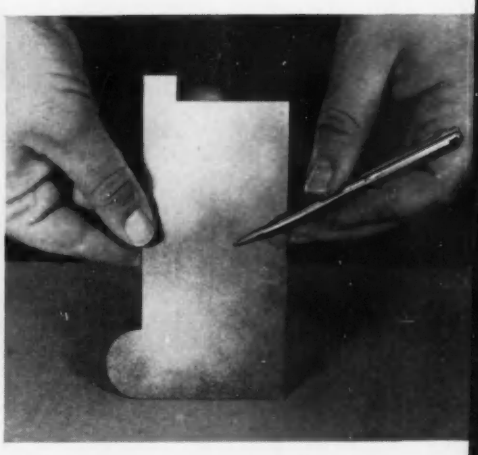
Sharpe's Ready Mark Flat Stock and saves layout time!"

Treating Dept., Brown & Sharpe Mfg. Co.

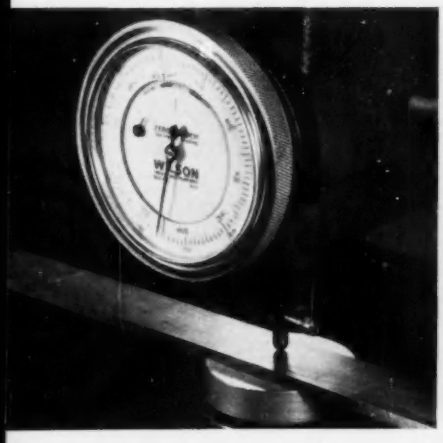


"Better yet — it saves you layout time. There's no grease to take off — no marking fluid to put on — no drying to wait for. Ready Mark Blue is all ready for layout when you get it. You just start scribing!

"Notice the color won't rub off or flake off the way marking fluids will. It won't even wash off in water, oils, coolants, or other agents used in shops. Your layout lines stay sharp and clear, through tough handling and machining.



"Color burns off during heat treatment, without affecting the treatment—leaves the piece at finish tolerances. This color deposit doesn't penetrate the steel or tend to etch the surface — so it doesn't have to be ground off later.



"Under the color, you get the country's best free-machining, non-deforming A.I.S.I. Type 01 Oil Hardening Tool Steel. Every lot is quality tested to be sure that it meets rigid Brown & Sharpe specifications.

"We grind it to precise sizes for you — every one free from decarb and machining stresses. They're colored . . . individually packaged . . . with complete description and heat treating instructions on each package.

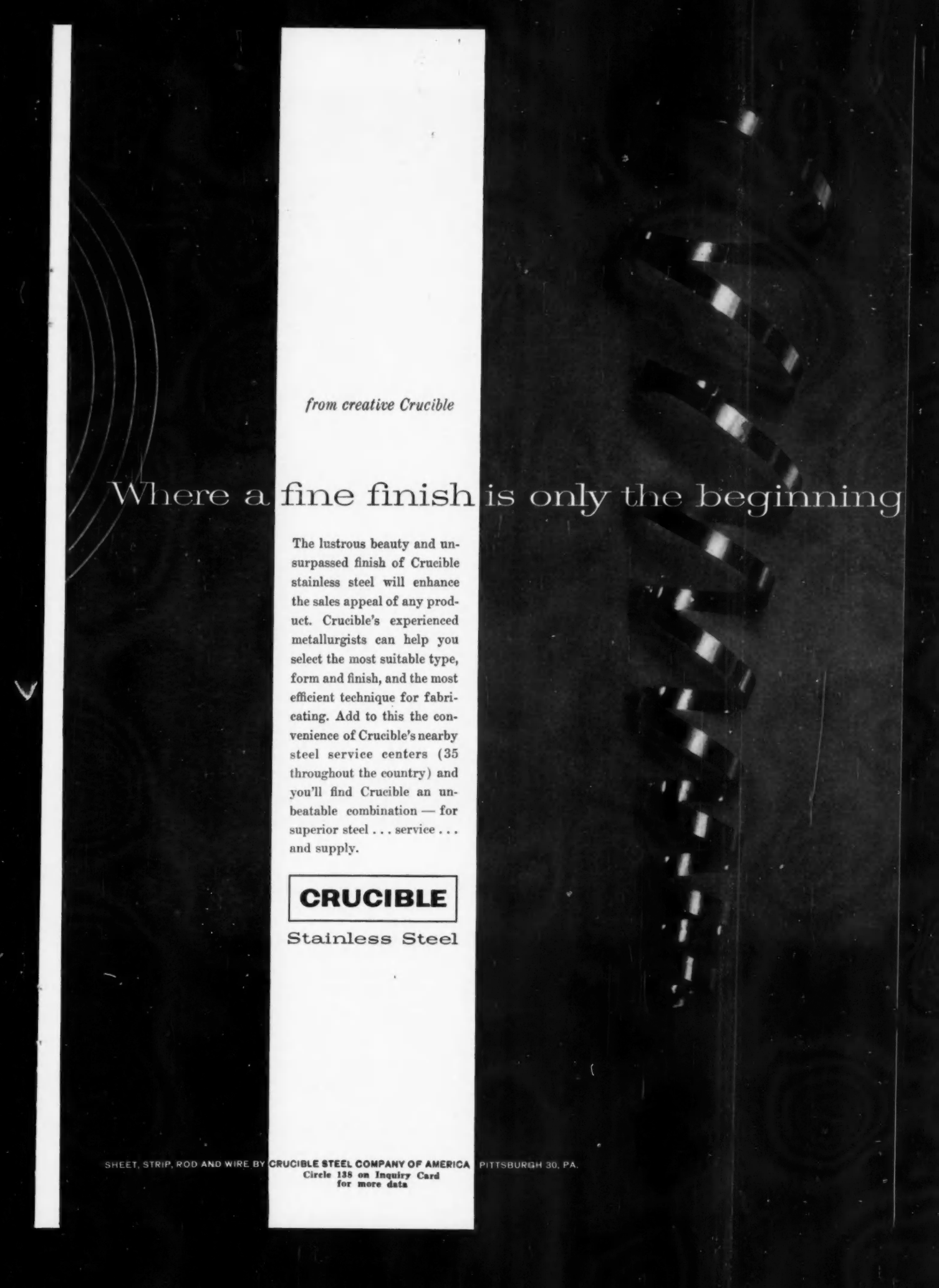
"You don't have to settle for anything less than Ready Mark. It doesn't cost a cent extra! And by switching to Ready Mark, you make steel handling easier for everybody from the tool crib to the heat treating department."

Get it, fast, from your Brown & Sharpe distributor. Brown & Sharpe Mfg. Co., Providence 1, R. I.

Also available from Brown & Sharpe: Bright finished flat stock in same analysis and sizes as above • Ready Mark **Air-Hardening Die Steel,** colored **maroon.** (A.I.S.I. Type A2—has exceptional dimensional stability) • Bright finished **low-carbon "Thrift" Stock** • **Special sizes** in all types at reasonable cost.

Brown & Sharpe PRECISION CENTER

GOWN BY FON TAYNE; STAINLESS



from creative Crucible

Where a fine finish is only the beginning

The lustrous beauty and unsurpassed finish of Crucible stainless steel will enhance the sales appeal of any product. Crucible's experienced metallurgists can help you select the most suitable type, form and finish, and the most efficient technique for fabricating. Add to this the convenience of Crucible's nearby steel service centers (35 throughout the country) and you'll find Crucible an unbeatable combination — for superior steel . . . service . . . and supply.

CRUCIBLE

Stainless Steel

SHEET, STRIP, ROD AND WIRE BY CRUCIBLE STEEL COMPANY OF AMERICA PITTSBURGH 30, PA.

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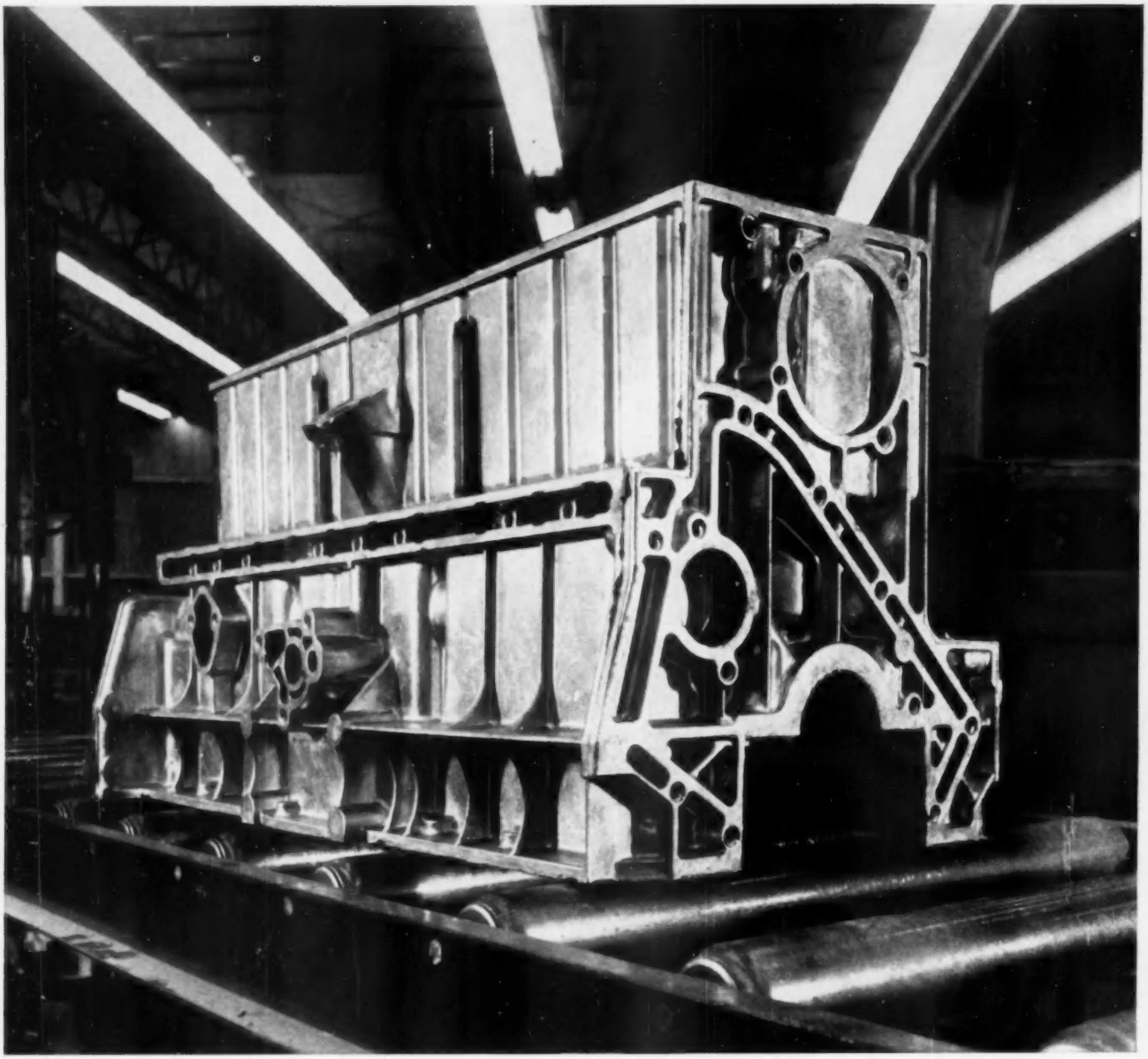


World's first die-cast aluminum "six"

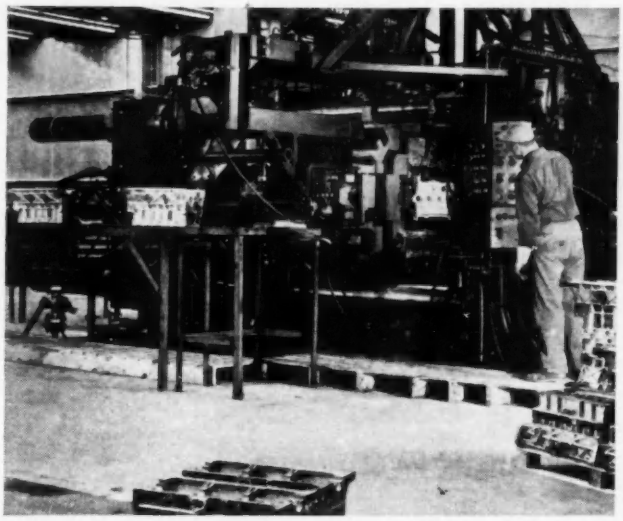
Saves 80 pounds for American Motors' new Rambler Classic . . . incorporates specially bonded cast iron liners in dry sleeve design.

This engine block is the biggest die casting ever mass produced. It's the world's first six-cylinder block for passenger car use to be die cast in aluminum.

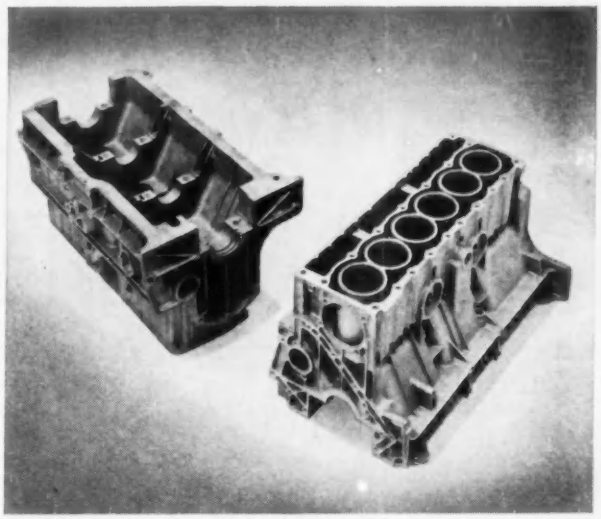
It's a 67 pound lightweight including 14 pounds of centrifugally cast iron cylinder liners. That means a total saving of 80 pounds deadweight . . . now standard in the new Rambler customs, optional in other Rambler models.

Light but strong. Aluminum's excellent physical properties are fully utilized by careful die cast design and photostress analysis. Outstanding strength, soundness and precision provide a big plus for heavily-emphasized Rambler quality.

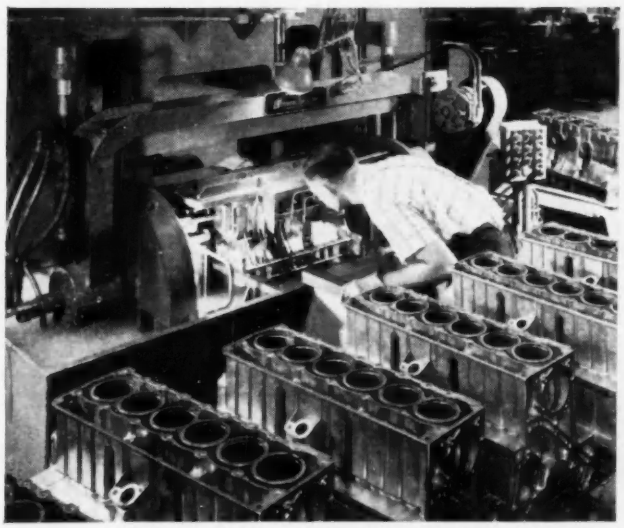
BMI bonding is simple and sure. The BMI—or Bi-Metallic Interlock developed by Doehler-Jarvis—mechanically "anchors" the liners by means of their specially prepared cast surfaces. Since these liners are centrifugal castings, no knurling, crimping or splining is needed. An intimate locking action occurs as the molten aluminum is injected into the die . . . under 8,000 psi. The result: an inseparable bond with excellent heat-transfer properties.



A block every three minutes . . . from 2,000 ton machines like this. In three tenths of a second, machine injects a 70-pound "shot" of molten aluminum . . . under 8,000 psi.



Centrifugally cast iron liners—up to 260 Brinell—are cast in place with specially prepared surfaces which lock inseparably with molten metal under pressure.



Pressure tightness of die-cast aluminum blocks is determined by testing on a machine specifically designed for this purpose. Advanced quality control helps protect highest standards.

Palletized for rapid delivery, these finished blocks can reach American Motors assembly plants by rail . . . or in trucks of the Doehler-Jarvis fleet.

rolls off the line at Doehler-Jarvis

To design for efficient production, American Motors and Doehler-Jarvis engineers combined specialized know-how with liberal imagination. An oil gallery for hydraulic valve lifters is an integral part of the block casting. Liner inserts and loose pieces for casting undercuts are placed by automatic attachments that never slow down the casting cycle.

To make new ideas pay off, perhaps you can use the facilities, resources and practical experience offered by Doehler-Jarvis. Eight plants provide the capacity—and the flexibility—to serve large companies well, and to help small ones grow. For detailed information, simply phone or write the nearest Doehler-Jarvis plant or office.

Doehler-Jarvis
Division of
NATIONAL LEAD COMPANY
General Offices: Toledo 1, Ohio
Plants at:
Toledo
Grand Rapids 2, Mich.
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Batavia, N. Y.
In Canada: **Barber Die Casting Co. Limited**
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Sao Bernardo do Campo, Sao Paulo

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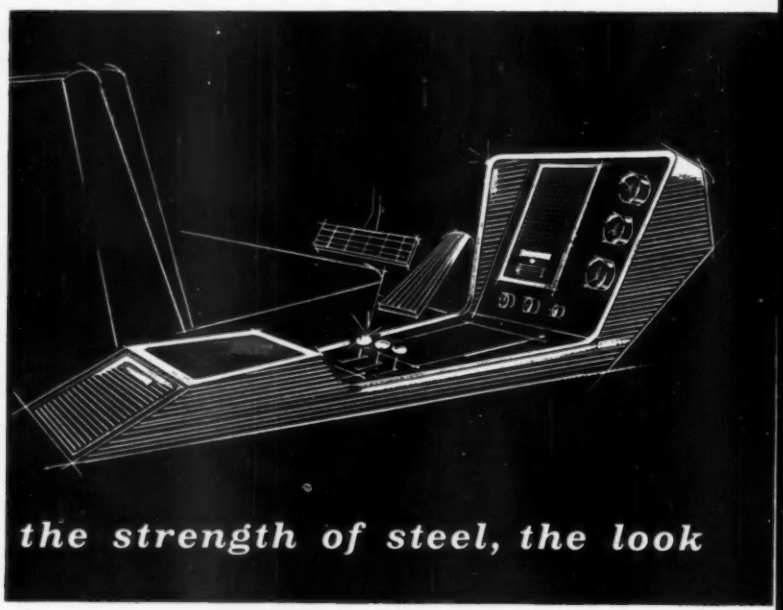

the strength of steel, the look

the tough, hard, rigid plastic from Borg-Warner

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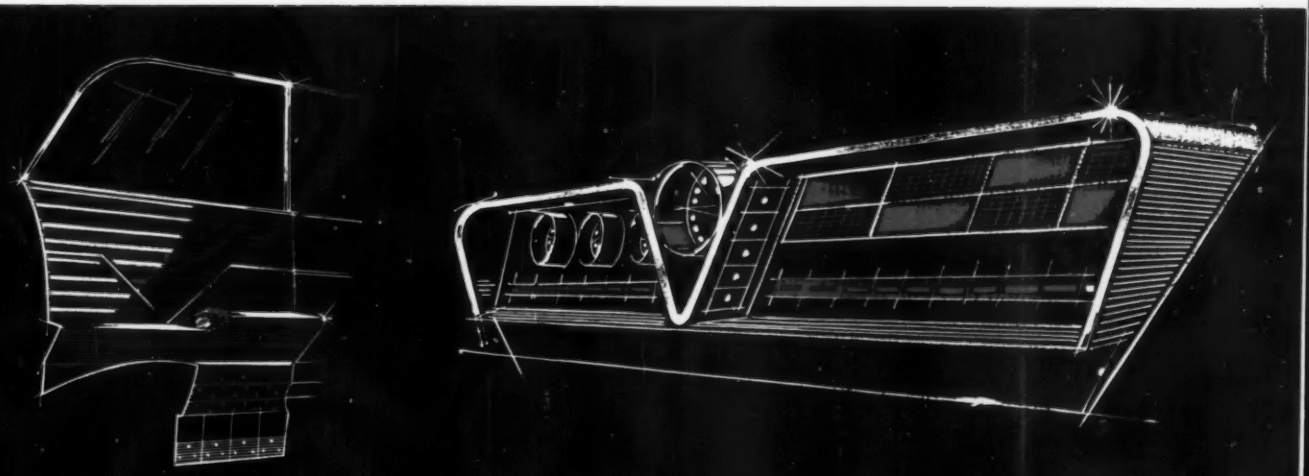

of leather, the feel of fabric, the freedom of plastic

***See the cut-away model car featuring a complete interior designed and fabricated ...**

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COLAC®

MARBON CHEMICAL WASHINGTON — MARBON BW CHEMICAL — DIVISION **BORG-WARNER** WEST VIRGINIA

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Almco, Queen Products Div. 78

Bendix Corp.
Products Div. 5
Bethlehem Steel Co. 22
Binks Mfg. Co. 68
Budd Co., Automotive OE 58-59
Brown & Sharpe Mfg. Co. 82-83

Clearing Div. U.S. Industries, Inc. Back Cover
Cleco Div. Reed Roller Bit Co. 79
Copperweld Steel Co. Aristoloy Steel Div. 16
Controls Co. of America 76
Cross Co. 10-11
Crucible Steel Co. 84-85

Detrex Chemical Industries, Inc. 28
Detroit Power Screwdriver Co. 8

Doehler-Jarvis Div. National Lead Co. 86-87
Dow Corning Corp. 9

Gaylord Products Inc., Controls Div. 74
Gillett & Eaton, Inc. 12
Gisholt Machine Co. 73
Goodrich Chemical Co., B. F. 21

Hassall Inc., John 78

International Nickel Co., Inc. 2

Luber-Finer, Inc. 54

McLouth Steel Corp. 6
Marbon Chemical Div. 88-89
Mechanics Universal Joint Div. 32
Michigan Tool Co. 14-15

Parish Pressed Steel Div. 30

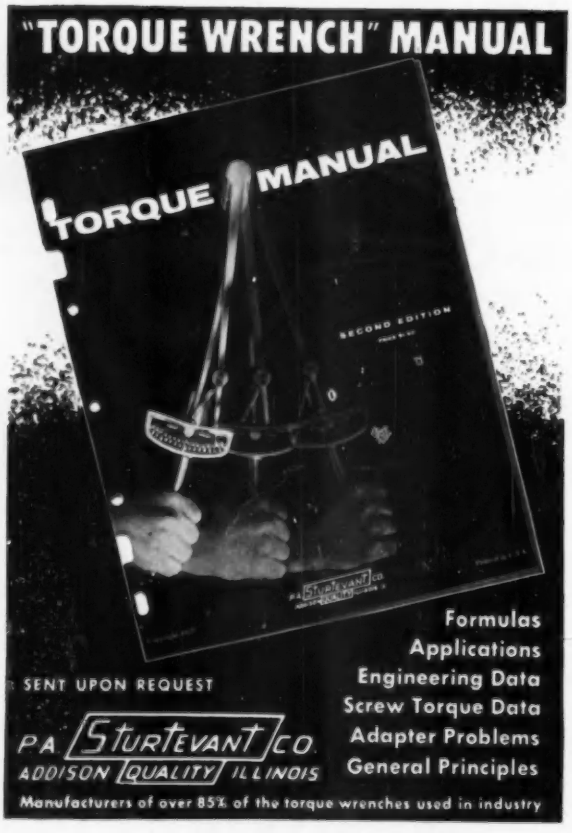
Reeves Brothers Inc. 90
Rockford Clutch Div. Borg-Warner 62
Rockwell-Standard Corp. 67
Roebling's Sons, Div., John A. 69
Ross Gear & Tool Co., Inc. 2nd Cover

Schwitzer Corp. 75
Southern Screw Co. 13
Sturtevant Co., P. A. 90

Texaco, Inc. 7
Timken Roller Bearing Co. 81
Torrington Co. 1

Udylite Corp. 77
Union Carbide Co. Silicones Div. 80

Wausau Motor Parts Co. ..... 3rd Cover
Western Felt Works 27
Wyman-Gordon Co. 70



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Be fabric wise . . .
Specify Reevecote
Most complete line of coated fabrics for the automotive industry—Whatever you need in a coated fabric . . . whether it's resistance to high temperature, oil, abrasion . . . or flexibility at low temperatures . . . you can be sure there's a REEVECOTE designed to do the job best.
Choose from natural or synthetic rubber coatings. Get the protection of Reeves Brothers quality control. For better coated fabrics, always specify REEVECOTE.
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New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more Information on New Production Equipment and New Products described editorially in this issue

FREE POSTCARD INQUIRY SERVICE

Just circle the Numbers you want on Inquiry Postcards, and mail promptly

By C. J. Kelly
ASSISTANT EDITOR

Diaphragm Seals 1

A 28-page manual covers the selection and application of rolling diaphragm seals for hydraulic and pneumatic actuators, controls, and specialized devices. *Bellofram Corp.*

Plasma Coating 2

This booklet describes the plasma coating process, the properties and uses of coatings, and lists materials of common interest and their properties. *Plasmatech Div. of Valley Metallurgical Processing Co., Inc.*

Lubricant Folder 3

A four-page brochure describing an extreme pressure anti-scoring lubricant. The brochure indicates that CMD extreme pressure lubricant will withstand 20 tons pressure per square inch without break-down allowing metal-to-metal contact and consequent scoring, galling, etc. Uses of the product are described for lubrication in such operations or equipment as lathe centers, steady rests, thrust bearings, broaching, extruding, swaging, die-set posts, cams, machine ways, tapping, etc. *Chicago Mfg. & Distributing Co.*

Die Sets 4

A new 4-page brochure on die sets gives illustrations, sizes and other technical data on various sizes of all-steel die sets. A price list with quantity discounts is also included in the brochure. *Wheatley Economy Die Sets, Inc.*

Vacuum Furnaces 5

Eight-pages describe and illustrate vacuum-type furnaces. Pictures and drawings in this bulletin show hot-wall vertical retort vacuum furnaces, horizontal retort vacuum furnaces, vacuum bell-type furnaces, cold-wall vacuum furnaces and a vacuum-atmosphere retort tube for research and pilot-plant use. *Lindberg Engineering Co.*

Coil-Handling 6

Of interest to all who have to do with the handling of coils of strip steel is the 4-page descriptive bulletin on Coil Grabs and Coil Hooks. This Bulletin, CH-B1, gives complete specifications and has a number of action photos showing safety features and how the equipment is used. *Dixon Automatic Tool, Inc.*

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(Please turn page)

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21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220
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New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more information on New Production Equipment and New Products described editorially in this issue.

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By C. J. Kelly
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Aluminum Alloy 7

Special features and characteristics of Tenzaloy, a proprietary high-strength aluminum casting alloy which ages at room temperature yielding mechanical properties equivalent to heat treated alloys, are described in a new brochure. The eight-page brochure lists specifications and nominal composition, tabulates physical and mechanical properties, and gives details of casting methods, dimensional stability, corrosion resistance, machinability and welding, brazing and plating techniques. *Federated Metals Division of Asarco.*

Machine Booklet 8

Brochure describes the complete line of Bardons & Oliver machine tools. This includes five completely different ram type and saddle type turret lathes, offering collet capacities from 1 to 5 in. Also shown is the complete line of cutting-off lathes, ten different sizes offering collet capacities from 2 to 16 inches. The brochure lists complete machine specifications for both turret lathes and cutting-off lathes. *Bardons & Oliver, Inc.*

Precision Parts 9

A 24-page catalog outlines bobbin, washer and precision-made stock parts available for immediate delivery. Listed are properties of Nylon, Teflon and Epoxy materials, product illustrations, and specifications on more than 500 parts available from stock. For special parts made to specifications maximum and minimum sizes and shapes are clearly defined. *Cosmo Plastics Co.*

Reinforced Plastics 10

The six basic techniques used by the Reinforced Plastics Industry to mold thousands of products are explained in a 10-page, letter-sized booklet just published. Intended as a convenient data guide for design engineers, purchasing agents, manufacturers and others interested in reinforced plastic molding, the booklet describes each molding technique and lists its specific advantages and applications. Also given are physical and chemical properties of parts molded by each method. *Reinforced Plastics Div. of The Society of the Plastics Industry, Inc.*

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Furnace Data 11

A full-color brochure describing a new continuous controlled atmosphere furnace for heat treating cold-finished bars has been published. The four-page brochure explains how this furnace—and the exclusive Electreat process — provide a full range of heat treating processes for users of cold finished bars. *Jones & Laughlin Steel Corp.*

12 Flame-Cutting Machines

A complete line of Oxweld flame-cutting machines is described in a 28-page catalog. Machines described range in size from small, handy portable machines to huge multi-torch shape-cutting machines capable of reproducing the most intricate shapes and patterns in steel. Also included are complete specifications for each machine, illustrations of typical installations, and a description of a wide variety of machine accessories. *Linde Co., Div of Union Carbide Corp.*

Drill Press Line 13

The recently introduced line of Delta 17-inch drill presses, featuring an all new "up-front" power feed operated with only one hand, is described in a ten-page, two-color bulletin. Numerous action photographs, close-ups and text included in the bulletin describe in detail the specific operations and the outstanding features of this new line of drill presses. The bulletin also includes complete specifications, dimensional data and complete catalog listing including motors and motor controls. *Rockwell Manufacturing Co.*

Packaged Controls 14

Bulletin GEA-6334A, eight pages, describes Pan-A-Trol panels for use with machine tools, pumps, materials handling equipment, presses, agricultural machinery and similar equipment. Publication explains product features and reliability and how panels are specially designed and tailored for specific control needs by engineers at G-E's General Purpose Control Department. Photos show various devices used in the packaged control unit including contactors, starters, relays, switches, timers, terminal boards and push buttons. *General Electric Co.*

Air Cylinders 15

Bulletin 0230-B1 provides concise engineering data and specifications on the new maximum 200 psi, series "S" midget air cylinder. Both universal mounting and nose mounting models in ¾, 1 and 1⅛ in. bore sizes with standard strokes to 12 in. are fully described. Special reference is made to the four basic mountings inherent in the midget air universal design as well as the added versatility provided by optional mounting attachments. A cut-away diagram points out the internal and external features of this compact, small force air cylinder. *Hannifin Co.*

Blanking Booklet 16

A new 6-page, illustrated catalog describing the newly developed Hydro-Cam Smooth-Edge blanking process that produces precision stamped low carbon steel, stainless steel, aluminum, brass and copper blanks with straight, smooth edges in a single operation from coil or strip stock is now available from *Hydro-Cam Engineering Co.*

Truck Catalog 17

Named number 135, a new catalog contains illustrations, descriptions and specifications data on the manufacturer's more popular truck models. Included are four-wheel platform trucks, stake trucks, box trucks, wagon trucks, shelf trucks, dollies, two-wheel trucks and other standard trucks for a wide range of individual requirements. *Hamilton Caster & Mfg. Co.*

Nickel Plating 18

A 16-page technical instruction bulletin describes a nickel sulfamate process. It is a bath for heavy build-up for metal resizing, electroplating, electroforming, and other functional uses. The bulletin illustrates (with micro-photographs and charts) and completely describes solution preparation for both still and barrel operations; effects on deposits of using various proportions of solution's constituents, effective temperatures, current densities and voltage requirements; purification methods; analytical procedures for constituents; equipment and materials needed to successfully operate the nickel sulfamate bath. *Hanson-Van Winkle-Munning Co.*

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Rectangle Sizes 19

Twenty-two new stock sizes of extruded rectangles are included in a revised bulletin. The 4-page, Bulletin (G-50b) describes Ampco's line of extruded rectangles for severe wear and abrasion applications. It lists physical properties, lengths and tolerances and typical uses of the rectangles which are offered in two alloys—AMPCO 18 and 21. *Ampco Metal, Inc.*

Recording Systems 20

Applications for digital tape recording techniques are described in a 20-page brochure, Number DD-7. Among applications described are communications, filing, media conversion, acquisition and reduction and high and low speed sampling. Functional and block diagrams are included. *Minneapolis - Honeywell Industrial Systems Div., Minneapolis-Honeywell Regulator Co.*

Welding Torch Data 21

The availability of a new technical and illustrated bulletin, WC-60, describing the recently developed controlled angle torch for tungsten inert gas, arc welding has been announced. It describes the design features and applications of the new torch, and illustrates its use in hard-to-reach corners and at unusual angles. Complete specifications, are included. *Falstrom Co.*

Numerically - Controlled Lathe 22

A new CINTIMATIC numerically controlled lathe is illustrated and described in an 8-page catalog. General specifications of the all-geared head lathe are included. The catalog includes a description of the method of programming this new all-geared head lathe, as well as general specifications and standard and optional equipment. *Cincinnati Lathe & Tool Co.*

Cut-Off Wheels 23

A new catalog bulletin describes regular resinoid bonded abrasive cut-off wheels. Information is presented about production cutting use, as well as general use in toolrooms and machine shops. Recommended grain and grade specifications for various materials are included. *Simmonds Abrasive Co.*

Wall Charts 24

Two wall charts show the distinctive traits of the Oxy-LP Gas flame in comparison with the Oxy-Acetylene flame. Each chart has nine reproductions in full color, with four illustrations referring to the welding flame and five to the cutting flame. The charts are 11 by 17 in. size, suitable for training and education; and fold to 8½ by 11 in. to fit standard size catalogs. *Smith Welding Equipment Corp.*

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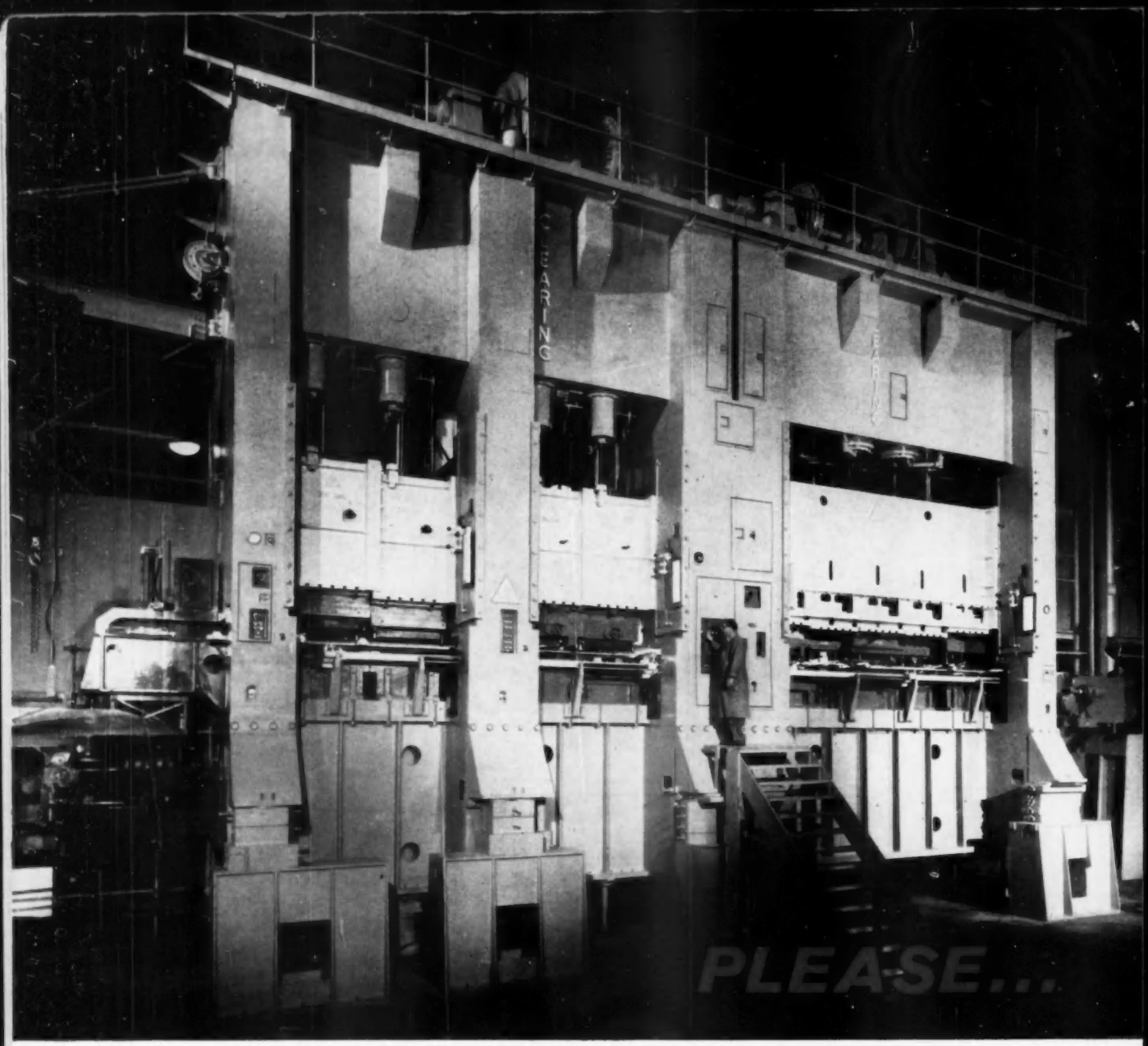

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